THE MARINE REVIEW

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NAVAL ARCHITECTS AND MARINE ENGINEERS

At the meeting of the society of Naval Architects and Marine Engineers the following were admitted to membership at a special meeting of the council held on Friday, the names having been presented too late to be regularly acted upon at the regular meeting of the council on Wednesday:

For Members—J. Irvin Chaffee, professor of mathematics, Webb's Academy, Fordham Heights, N. Y.; Robert H. Laverie, superintendent, Shooter Island Ship Yard Co., Mariner Harbor, N. Y.

Associate to Member—H. R. Sutphen, vice president and general manager, Electric Launch Co., Bayonne, N. J.

Juniors—Frank E. Bagger, draughtsman, Tietjen & Lang Dry Dock Co., Hoboken, N. J. House, Fort Hamilton Ave. and 70th St., Brooklyn, N. Y.

John C. Burkhard, student naval architecture, Sibley College, Ithaca, N. Y.; Fayette M. Cook, student naval architecture, Sibley College, Ithaca, N. Y.; Harry A. F. Lynx, draughtsman, C. & R. Dept., Navy Yard, N. Y. House, 214 East 75th St., New York; Fritz A. Postel, student naval architect, Sibley College, Ithaca, N. Y.

The MARINE REVIEW in its issue of Dec. 5 brought the discussion of the proceedings of the Society of Naval Architects and Marine Engineers to the conclusion of Naval Constructor L. S. Adams' paper entitled "Motor Boats for Naval Service." Immediately following Henry R. Sutphen's paper on "High Speed Motor Boats for Pleasure Use," was presented as follows:

HIGH SPEED MOTOR BOATS FOR PLEASURE USE.

Several manufacturers are now prepared to deliver from stock, or upon short notice, 18 and 25-mile motor boats equipped with gasoline marine engines for pleasure use. About four years ago the high-speed gasoline launch was first introduced in this country. The rates of speed then obtained were remarkable in comparison with the average launch of that day. The first boats produced were designed particularly for racing and developed speeds of from 24 to 27 statute miles per hour, the hulls being of light construction and the engines of minimum weight. From the experience in building the racing launch, the high-speed pleasure boat has been developed, which fills the demand that has long existed for a safe, seaworthy boat that could cover distances over the water in the shortest possible time.

On Sept. 28 I acted as one of the timers in the speed trial of the motor boat Irene over the government knot course on the Hudson river. The boat was run over the course six times, three with the tide and three against. The time for the various runs is given in the following table:

IRENE'S MILE TRIALS.

Saturday, September 28, 1907.

Timers: Henry R. Sutphen, E. A. Stevens Jr.
Weather: Cloudy and calm.

IRENE:

Down.....2.17—26.277	25.904				
Up.....2.21—25.532	25.726	25.815			
Down.....2.17—26.277	25.726	25.726	25.77		
Up.....2.23—25.175	25.300	25.513	25.513	25.694	25.597
Down.....2.18—26.087	25.205	25.252	25.382	25.500	
Up.....2.28—24.324					

25.597 nautical miles = 29.4753 statute miles.

This is the highest speed that has been recorded in the trials held by the Motor Boat Club of America, which are yearly events, over the government knot course on the Hudson river.

No special preparation had been made for the Irene's speed trials, the boat having on board during the trial 180 gallons of gasoline, five men and full equipment, the total weight being about 5,600 lbs.

The Irene was designed and built by John S. Sheppard, of Essington, Pa., who states that in racing trim the total displacement of the boat figures a little less than 25 lbs. per horsepower. The two engines installed were built by the Chadwick Engineering Works, Philadelphia, Pa., and are each rated at 100 H. P., each engine being of four cylinders, 8-in. bore × 7-in. stroke, turning 850 R. P. M. The propellers are of 3-blade, 24-in. diameter, 44-in. pitch.

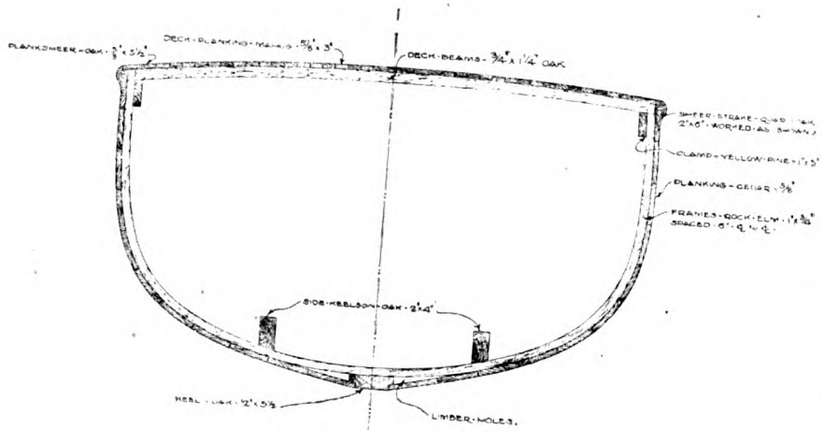
A photograph is published of the Irene at full speed, with amidships section showing scantlings and planking employed. In comparison with a typical racing boat, the Irene could be classed more as a pleasure launch, the hull being of medium weight with wide beam and high freeboard. Total length of boat, 39 ft. 8½ in.; beam, 6 ft. 6 in.; draught at propeller wheel, 3 ft.; freeboard amidships, 26½ in. Large seating capacity is provided aft to accommodate 8 to 10 passengers, the general lines showing a fine entrance at the bow; amidships section as shown in plan, with a broad, flat stern, the latter materially assisting in holding the boat on an even keel when running at high speed.

The Irene is one of the first high-speed motor boats in this country to be equipped with twin screws, which give some advantage over the single screw for high-speed service. The side thrust of the single propeller is of considerable moment, and in some boats this is so great as to cause a decided list when running at high speed. With twin screws this is entirely obviated, and while the total weight of the power equipment is a little more, the steady operation of the boat in the seaway and while turning at full speed is of great advantage.

On account of the initial cost, cost of operation and maintenance, few desire for pleasure purposes a boat of 200 H. P.. and I therefore present photographs and drawings of high-speed motor boats of moderate power, which are the general type now built for pleasure use.

The 33-ft. Elco express boat, 5 ft. 6 in. beam, is of light but substantial construction, equipped with a 4-cylinder, 40-H. P. gasoline engine of the auto-marine type, and develops a maximum speed of 20.4 statute miles an hour, as shown in the speed and horsepower curve. A section illustrates the scantlings employed in hull construction, the elevation and plan showing the general arrangement of power equipment and seating space. The weight of hull is 1,050 lbs., being in proportion to weight of power equipment (1,010 lbs.); seating capacity, 8 to 10 passengers. This type of boat has proved very seaworthy, reliable in operation, and easily controlled.

Two illustrations are given of a 40-ft. Elco express boat, 5 ft. 6 in. beam, details of construction being shown in the amidships section. This boat is equipped with a 4-cylinder, 70-H. P. engine, and develops a speed of 24.4



MIDSHIP SECTION 40-FT. ELCO EXPRESS.

statute miles per hour. The general arrangement is similar to the 33-ft. boat and is the plan usually employed in this type of launch. The engine is located forward under removable hood, separated from the operator and passengers, the controlling levers being placed on the bulkhead aft of the engine, at which point the steering wheel is located, enabling one man to operate the boat, who oftentimes is the owner. To give the passengers protection from flying waters, headwinds and rain, a glass wind-shield and folding hood are provided as shown in the illustration. This type of boat, it is claimed, will serve one on the water as the automobile does on land.

While the principal development of the high-speed launches has been in the *open* type of boat, attention has lately been given to the cabin launch, affording still further protection, comforts and carrying capacity combined with high speed. A photograph of the Carlotta illustrates a 40-ft. by 8-ft. beam cabin launch of unique design. The motor is placed forward, protected with hinging hood, controlling levers and steering wheel located in engine cockpit. The boat is handled and the engine controlled by one man; an open space covered by the cabin roof adjoins the engine compartment, separated by a glass wind-shield; with a commodious cabin amidships enclosed by plate glass windows with buffet and toilet compartments. The amidships section shows the scantlings and details of construction, which are light but found to be substantial. The boat is equipped with a 6-cylinder, 75-H. P. engine, with which power a speed of 18.85 statute miles an hour has been obtained. The photograph was taken when the boat was running at full speed.

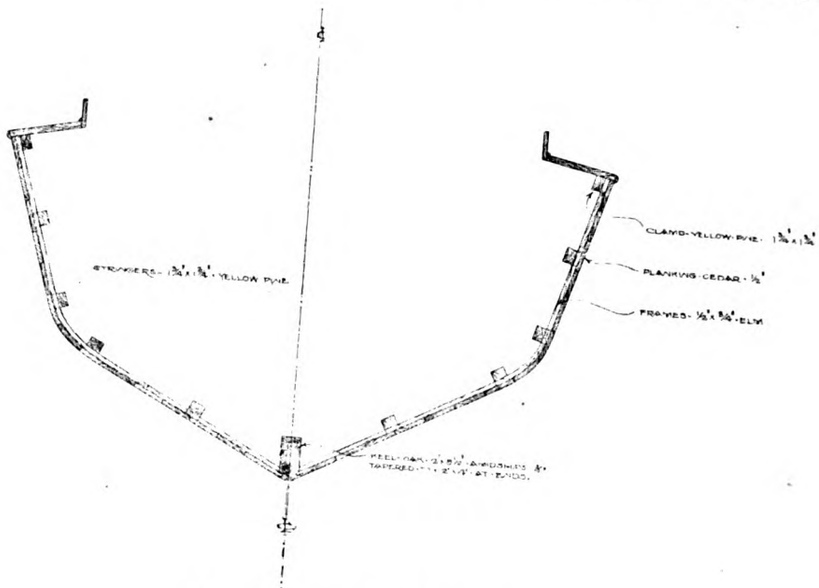
The possibilities of further development of the high-speed motor boat for pleasure use are only limited in details of hull and engine construction, the aim being to design and build boats that best conform to the high-speed gasoline marine engine, which has made possible this new type of power boat.

DISCUSSION.

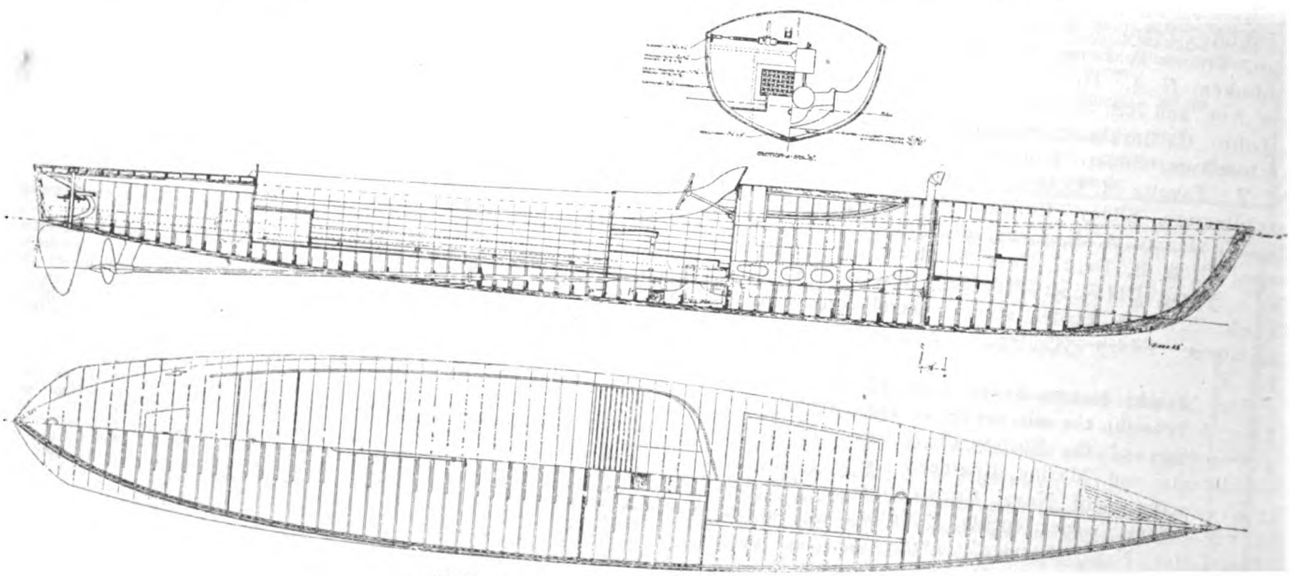
Col. E. A. Stevens submitted the following communication:

I shall not be able to stay for Mr. Sutphen's paper. Will you kindly ask Mr. Sutphen how the curve of effective horsepower was derived. The vessel is not very different in type from the Vingt-N-cen, whose trial data was very fully given by Mr. Crane in the transactions of 1904. The displacement length coefficient is in one case 30.7, in the other 29.6.

Curves of residuary resistance plotted on the speed length ratio and derived from the curves as pub-



MIDSHIP SECTION SPEED LAUNCH IRENE.



CONSTRUCTION PLAN OF 40-FT. ELCO EXPRESS.

lished in this paper and Mr. Crane's are very similar in form, but differ considerably at equal speed ratios.

Mr. Crane derived the effective power from the brake horsepower curve and the curve of propeller efficiency which was deduced by Froude's system from the slip curve. Mr. Sutphen's slip curve is figured on wake factor of 2 per cent. Will Mr. Sutphen add to the obligation under which he has placed the society by stating how this wake factor was arrived at? Also how the effective horsepower was determined. May I add a word of recognition of the value of papers giving data of this character?

W. P. Stephens: This paper covers in a brief way an interesting development of the motor boat which should appeal to those who are looking towards its use in naval service. Three or four years ago motor boats were only toys, used experimentally, and aimed at high speed and nothing more; they were of no practical utility, and the boats which were then in use were of no more use than the racing shells. The boats today, their outgrowth, are as serviceable on water as automobiles on land, and their position is as recognized on water as is the position of the automobile on land. They afford a safe and rapid means of transit and are in general use, and are entirely different from the old vapor launches. Their characteristics and speed are so different that they represent a new class, a new development, and simply go to show one of the possibilities of the modern gasoline engine.

NOTE ON THE BERMUDA RACE.

The next paper read was entitled "Some Observations on Motor Propelled Vessels and Notes on the Bermuda Race," by William B. Stearns. In Mr. Stearns' absence it was read by Mr. Cox. Attention will be given to this paper in the REVIEW later.

DISCUSSION.

The secretary: I have a communication from A. Cary Smith on this paper, which I will read.

"Replying to your favor of Nov. 14 asking me to criticize the article to be read by W. B. Stearns at the meeting of Nov. 21 and 22. Mr. Stearns went on board of his boat and is entitled to all the credit that he can reap from his efforts. The Ailsa Craig had never been tried out and I was not on board of her more than three hours, and feel that under the circumstances that on my part, silence is golden."

A. E. Luders: I think we gather from this paper by Mr. Stearns that he felt he was going to sea in a boat not perfectly adapted for the purpose, and his efforts here seem to show that he endeavored to make a wide shoal body which ordinarily is not considered a satisfactory seaboat, instead of a boat which was easy in sea way. His method of leaving out weight aboard ship, and distributing the weight fore and aft would overcome the rapid movement due to the buoyancy of the great beam and overhanging end. As a rough comparison between the two boats, I made a general figure of the bottom B. M. of the two boats and the B. M. on the Idaho, is about 7 ft., and on the Craig is 3 ft. Mr. Stearns reduced the G. M., I do not see the figure here, but he reduced it considerably by the stowing of weights, and we can see the positive G. M. in the Ailsa Craig is absolutely necessary, to put all weights below, and the further precaution is necessary to put weights along the keel. In the case of the Ailsa Craig the lack of overhangs is explained by the fact that the overhangs are not necessary, nearly as much as they would be in the case of the other boat, for the reason that in the Craig boat the weights were stowed amidship, that is, the gasoline, and most of the ballast, and the engine, whereas in Mr. Stearns' boat I believe he had the gasoline forward in the eyes of the boat, and of course to counteract that there was gasoline in the after cockpit. In the Ailsa Craig we see that the designer has gone the full limit in the length, presumably to raise the critical or un-economical speed of the boat as high as possible. He was driving his boat with considerably more power than the Idaho would require to drive it.

I think for general crusing, from the results shown, you would have to go into the design of a boat which made a compromise between these two, retaining some of the narrow beam of the Ailsa Craig, rather widened up a bit, as the Idaho was, and deepened a bit, to give her sharper seaway.

Regarding the steering, Mr. Stearns makes the remark that this boat steered rather wildly in a following sea, and infers it was lack of size of the rudder. Of course, it was not in that race, where they were driving her, but in an ordinary cruising boat they would have reserved speed, and could speed the boat up and outrun the breeze, or drop down and let the breeze go by, in which case I think the steering would have been easier. Another thing, I understand was that in the Idaho it was almost impossible to keep the boat on a steady course with the wheel, that is, the rudder did not act quickly enough, in fact, I believe part of the time it was necessary to steer with the tiller and under that condition the boat could be held on her course admirably.

I am sorry Mr. Stearns is not here today, as I should like to have gotten some information from him as to how his craft reversed, that is to say, how she maneuvered going astern. A great many of the boats of that type, with a long hollow, none of the dead wood cut away aft, are not very reliable in maneuvering astern.

Regarding the point Mr. Stearns brings out about the isolated engine room, I do not think there can be any question raised by any one but that that is the right thing. Furthermore, it seems to be the gasoline itself should be in the engine room, also isolated from the rest of the boat, and the galley, of course, kept away from that compartment. That would permit of a structural refinement which most of these trunk cabin launches lack, that is a good die out at each end of the engine space. The lack of that is shown in probably three out of five boats that you see, when you see them "hogging." Another feature that perhaps Mr. Stearns has found discouraging, and is very discouraging in the design of the boats, is when the designer goes to great expense and care in making what he considers a perfect engine insulation, he very often receives a machine in which the carbureter is entirely unprotected, that is to say, up to the carburetor the gasoline pipe is admirable, but when you come to the carburetor you have an open device which, in starting the engine, you might have to pry or manipulate in some manner, and the result is that the gasoline trickles down and underneath forms a dangerous place. In many of the engines the air inlet of the carburetor is geared with the crank case. I presume that makes a pretty good job of it, but then again I can believe there might be a disastrous explosion in the crank case at times. I suggest it might be possible to allow the carburetor to drip into a pan properly flushed with water. The principal objection to this is, of course, that in most cases the carburetor is below the water line of the vessel.

F. L. DuBosque: We all realize that from small things you must go

into larger ones, and it was called to our attention this morning how the internal combustion engine was to supplant all other engines in use. Glancing around, as I have before remarked, I notice this afternoon here a great many gentlemen who have spent almost their entire time in the development of particular types of gasoline engines for motor boats. We all objected to gasoline engines, because we thought them dangerous, and many of us object to them now, but we are told they are safe if properly taken care of, which is no doubt a fact, because tons of gasoline are being carried every day over our railroads; but notwithstanding this, gasoline engines must be put in the hands of inexperienced people at times.

Now, about a year ago, or more than a year ago, after considerable agitation in this country a law was passed permitting the use of denatured alcohol for mechanical purposes. Now it occurs to me that the solution of the gasoline engine for battleship work, for naval warfare, as well as for commercial purposes, seems to be the use of denatured alcohol, and as we have always been very liberal in our discussion of subjects in this room, it seems it might add a little bit to the value of our proceedings to have the opinion of some of the gasoline engine manufacturers as to what the probability is of using denatured alcohol for gas engine propulsion. We all realize that the suction gas producer is not a machine that can be used on pleasure launches, it takes up a great deal of room and weighs a great deal more than the gasoline engine, and is somewhat dangerous in the fact that it gives off dangerous gases, gases that kill people, and so many of us look to the rapid use of denatured alcohol for this purpose; and I think it would be a great deal of benefit to know if any experiments have been made and the results of them, in the use of denatured alcohol, by the gasoline engine people here.

W. P. Stephens: In connection with this discussion we were told of the great danger of gasoline. There is no use in minimizing that danger. It exists, and the only safety lies in a thorough realization of the danger of gasoline on the part of everybody who ues it around a vessel and elsewhere, but it must not be understood that the danger is any reason against the use of gasoline boats, and until we get either a better or cheaper fuel, or both, men and women will use gasoline for a great variety of purposes. We cannot give up the use of gasoline in a launch because there are dangers connected with its use. We hear of disasters very frequently through the use of gasoline both in launches and automobiles, but no one proposes for a moment to give up either means of transportation on account of the danger incident to the use of gasoline. The thing is to learn to handle gasoline in the proper manner, and we know that that can be done, if men will realize the importace of handling it carefully.

Mr. Stearns told us of something which is new in its application, in his proposed plan to make an engine room safe in a seagoing launch. It is important in any launch, but more important in a launch at sea to guard against fire. He has described the proposed means, and I think until we get better fuel, it lies with everybody connected with the launch to pay first attention, above speed and everything else, to the absolute safety of installation of the gasoline plant. It can be made safe as far as any ordinary thing can be made safe. It rests with the engine maker, the builder, and owner, to make the gasoline launch safe and satisfactory until we have something metter. The paper is rather notable in one way, in that the writer was virtually the owner of the boat, and also the designer and builder. It is so rare that a designer goes to sea in his own boat, that what he says ought to be well worthy of consideration.

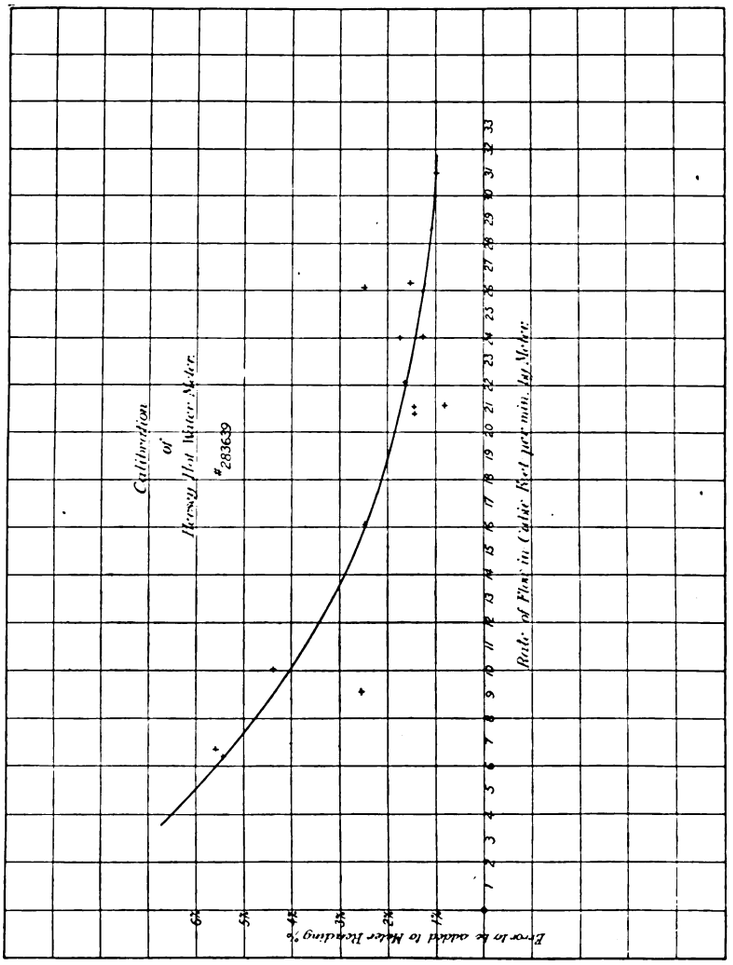


FIG. 1.

The president: If there is no further discussion, the chair will announce that the customary vote of thanks is extended to Mr. Stearns for his interesting paper.

The meeting then ajourned until Friday morning.

FRIDAY MORNING'S SESSION.

At the opening session on Friday morning Capt. William Hovgaard, in the absence of Prof. W. S. Leland and H. A. Everett, read the paper entitled "Test in the S. S. Governor Cobb." This paper is given in full because it is necessary to do so in order to render the subsequent discussion intelligible to the reader; but

no paper ever read before the society created such a storm of criticism for inaccuracy and incompleteness, and there was serious talk of striking it from the transactions. The paper follows.

TEST ON THE GOVERNOR COBB.

The test on the S. S. Governor Cobb, of the Eastern Steamship Co., was run by the Massachusetts Institute of Technology to provide thesis work for some of the graduates in the department of naval architecture.

The test was run on the regular trip of the Cobb from Boston to St. Johns, via Portland and Lubec. Observations began on passing Boston light and were continued for 26 hours; for the boiler test continuously; for the engine test at favorable times.

All observations were plotted, which presents an interesting study of the results and makes simultaneous readings possible with a limited corps of observers. The close agreement of these curves is a good check on the accuracy of the observations.

Time has not permitted the preparation of a complete report, but merely a summary of that portion of the test run at full speed under the most favorable conditions.

The horsepower was determined by means of the Denny and Johnson torsion meter belonging to the U. S. S. Chester, which was loaned by the Bureau of Steam Engineering, Navy Department, through the courtesy of Admiral Charles W. Rae, chief of the bureau. The details of the loan were arranged by Benjamin C. Bryan, lieutenant-commander U. S. N., who gave the matter his personal attention and accompanied our party on the test.

The torsion meter was set up in the engineering laboratory and a thorough working knowledge obtained by the use of experimental apparatus, before installing the meter on board. Thirty-six feet on the side shafts, and 49 on the center shaft between inductors, was the greatest length obtainable which gave a meter reading of about 0.50 and 0.73, respectively, at full power.

In computing the horsepower, 1.506, based on an assumed torsional modulus of elasticity of 11,600,000, was used for the constant K in the formula—

$$\text{H. P.} = \frac{Kd^4rR}{CL},$$

in which d = diameter of shaft in inches [(6⅜).

r = torsion meter reading.

R = revolutions per minute.

C = inductor constant (12.5).

L = length of shaft in feet between [inductors.

The water consumption was measured by a Hersey hot water meter loaned by the Hersey Manufacturing Co. of South Boston. It was installed in the suction line between the hot well and the feed pump and gave exceedingly satisfactory results.

This meter was later calibrated under similar conditions, the curve in Fig. 1 showing the percentages of error. The plot of meter readings was struck in as a straight line showing practically a uniform rate of consumption, no point varying from the line by a quantity greater than 1 per cent of the total.

The steam for all auxiliary purposes was passed through the two auxiliary lines, one on each side of the vessel, and the quantity measured by its flow through orifices. A thin steel plate having a hole 1⅝ in. in diameter was inserted in each auxiliary line between two flanges near the boiler. Pressures were read simultaneously at both orifices and at no time showed a variation of over a pound after making the proper gage corrections.

The orifice was afterwards set up in the laboratory and its coefficient carefully determined by actually weighing the condensed steam under conditions similar to those on the boat.

Several buckets of coal were weighed and their average, which varied only 10 lbs. from either maximum or minimum, multiplied by the number of buckets was taken as the coal consumption. The plot of coal consumption, like that of the water, is a perfectly straight line showing a uniform rate.

The run from Boston to Portland was largely consumed in a progressive trial, the speed being taken by a stop-watch and a McGray electric log towed from the end of a boom well clear of the wake. The log had previously been calibrated by towing over the measured mile.

Results of speed and power are shown in the curves in Fig. 2.

The best run was made at full speed between Portland and Lubec, under the most favorable conditions of weather and sea. All observations were taken at 10-minute intervals, except the coal, which was recorded every 15 minutes. Fig. 3 shows the chief records during this run.

An attempt was made to determine the quality of steam, but as there were objections to tapping the main pipe a sample was taken from the drip connection which showed 2.5 per cent of moisture, which is more than would be obtained from a fair sample.

It may be of interest to compare the following tabulated results with similar results obtained from a test on the S. S. Nantucket of the Merchants' & Miners' Transportation Co.

RESULTS OF TEST.

	Nantucket.	Cobb.
Date of test	Feb. 7, 1904.	April 18, 1907.
Duration of test—boiler	20½ hrs.	8 hrs.
Duration of test—engine	20½ hrs.	4 hrs.
Boiler pressure (average gage)	147.3 lbs.	128 lbs.
Quality of steam (sampled at drip)	98.8	97.3
Barometer	14.7 lbs.	14.7 lbs.
Temperature of air pump discharge	.....	110 deg. F.
Temperature of feed water	209.4 deg. F.	213 deg. F.
Kind of coal used	Georges Creek.	Cape Breton.
Moisture in coal	2 per cent	1.9 per cent
Ash and clinker in coal	7.6 per cent	6.8 per cent
Draft at blowers	Natural.	2.1 inches.
Number of boilers (single-ended Scotch)	4	6
Total grate surface	320 sq. ft.	323 sq. ft.
Total heating surface, approximately	10,150 sq. ft.	12,000 sq. ft.
Coal fired per hour	5,135 lbs.	8,050 lbs.
Water fed per hour (average during engine test)	45,844 lbs.	85,710 lbs.
Coal burned per square foot grate surface	16 lbs.	24.64 lbs.
Maximum revolutions	.....	P. 475, S. 460 C. 400
Corresponding total shaft horsepower	.....	4,100
Average revolutions	74.05	447
Average total horsepower	2,362	3,747
Steam for auxiliaries	.....	38,360 lbs.
Steam per H. P. per hour, total	19.41 lbs.	22.87 lbs.
Steam per H. P. per hour (propelling machine only)	.....	19.74 lbs.
Speed (average)	15.00	17.21 k.
Type of engine	Reciprocating.	Turbine.
Vacuum in inches	25	27

DIMENSIONS.

Length between perpendiculars	274 ft.	290 ft.
Beam moulded	42 ft.	51 ft.
Draught	15 ft.	14 ft.
Displacement	2,700 tons.	

COMMUNICATED DISCUSSION.

Andrew Fletcher, president W. & A. Fletcher Co,: I regret exceedingly that business engagements will prevent my being present, as requested, when Prof. Leland and Mr. Everett's paper is read. I think it is very unfortunate that the paper should be presented at all, for many of the statements in it are not fair to the Governor Cobb and are most indefinite. In fact, to my mind, the paper could almost be considered but a memorandum of a test. As the Governor Cobb was the first Parsons turbine ship built in this country, the report of her test will probably go out to the general engineering world as though it was her best performance, not only as to economy but also as to speed, and a more careful and complete test should have been made.

Some months ago we received a letter from Prof. Peabody, stating that he intended to make a test of the Governor Cobb, and requested that we loan him the lines of her hull. This we declined to do for business and other reasons, but stated in regard to the test that we would be very glad indeed if he would let us know when the test was to be made and to give us two or three days' notice and we would have a representative on board at the time of the test. Evidently our refusal to loan the lines of the hull was very disappointing, for we received no reply to our letter from him or from any of his assistants, neither did we receive any notice of the test.

Tests, as you know, are generally made under fair, if not the best conditions, but in this case, we know, in comparison with what the Governor Cobb has done, that the preparations for and the operation of the test must have been most incomplete.

As the line shafting of the engine was not tested, it was hard for them to assume a torsional modulus of elasticity. We all know that assumptions are sometimes wrong, and this, of course, would affect the horsepower given. A comparison is made between the steamer Nantucket and the Governor Cobb's horsepower. Was the Nantucket's horsepower obtained in the same way as the assumed horsepower of the Governor Cobb, or was it indicated horsepower? This is quite important when a comparison is to be made.

It would be very interesting to know how they had previously calibrated the McGray electric log. Had it been towed over a measured mile at the stern of the Governor Cobb, or had it been towed over a measured mile from another steamer, a steamer of a lesser speed? We all know that logs are not always reliable, and that a log showing relatively correct under low speeds, as the speeds are increased will very often fall down and the results are therefore not always relia-

into larger ones, and it was called to our attention this morning how the internal combustion engine was to supplant all other engines in use. Glancing around, as I have before remarked, I notice this afternoon here a great many gentlemen who have spent almost their entire time in the development of particular types of gasoline engines for motor boats. We all objected to gasoline engines, because we thought them dangerous, and many of us object to them now, but we are told they are safe if properly taken care of, which is no doubt a fact, because tons of gasoline are being carried every day over our railroads; but notwithstanding this, gasoline engines must be put in the hands of inexperienced people at times.

Now, about a year ago, or more than a year ago, after considerable agitation in this country a law was passed permitting the use of denatured alcohol for mechanical purposes. Now it occurs to me that the solution of the gasoline engine for battleship work, for naval warfare, as well as for commercial purposes, seems to be the use of denatured alcohol, and as we have always been very liberal in our discussion of subjects in this room, it seems it might add a little bit to the value of our proceedings to have the opinion of some of the gasoline engine manufacturers as to what the probability is of using denatured alcohol for gas engine propulsion. We all realize that the suction gas producer is not a machine that can be used on pleasure launches, it takes up a great deal of room and weighs a great deal more than the gasoline engine, and is somewhat dangerous in the fact that it gives off dangerous gases, gases that kill people, and so many of us look to the rapid use of denatured alcohol for this purpose; and I think it would be a great deal of benefit to know if any experiments have been made and the results of them, in the use of denatured alcohol, by the gasoline engine people here.

W. P. Stephens: In connection with this discussion we were told of the great danger of gasoline. There is no use in minimizing that danger. It exists, and the only safety lies in a thorough realization of the danger of gasoline on the part of everybody who ues it around a vessel and elsewhere, but it must not be understood that the danger is any reason against the use of gasoline boats, and until we get either a better or cheaper fuel, or both, men and women will use gasoline for a great variety of purposes. We cannot give up the use of gasoline in a launch because there are dangers connected with its use. We hear of disasters very frequently through the use of gasoline both in launches and automobiles, but no one proposes for a moment to give up either means of transportation on account of the danger incident to the use of gasoline. The thing is to learn to handle gasoline in the proper manner, and we know that that can be done, if men will realize the importace of handling it carefully.

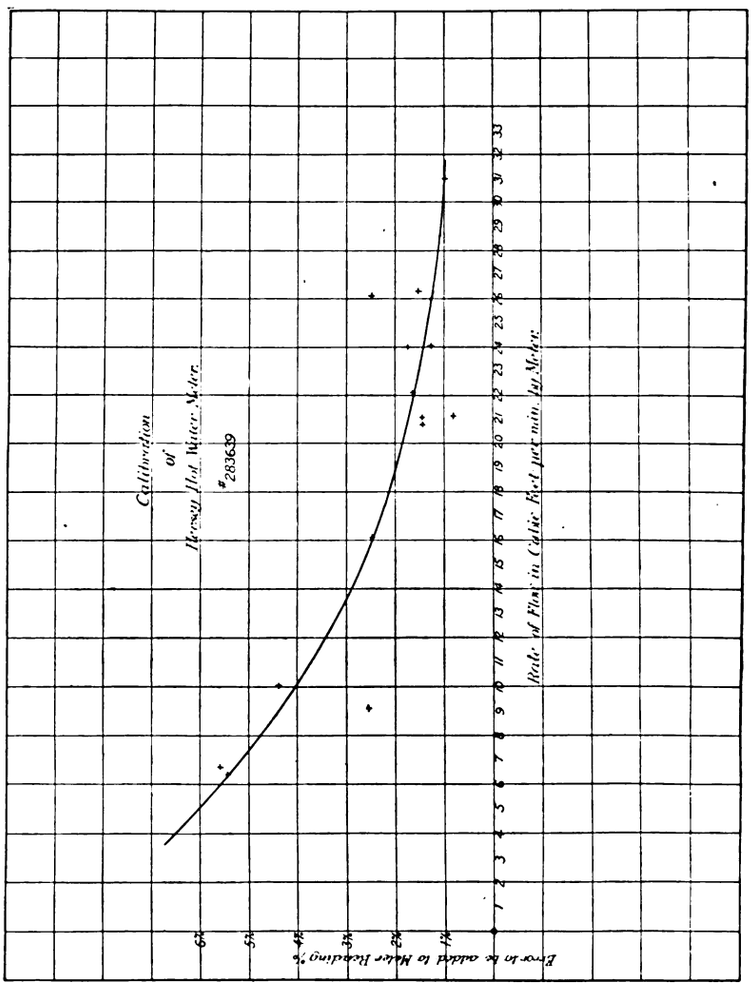


FIG. 1.

Mr. Stearns told us of something which is new in its application, in his proposed plan to make an engine room safe in a seagoing launch. It is important in any launch, but more important in a launch at sea to guard against fire. He has described the proposed means, and I think until we get better fuel, it lies with everybody connected with the launch to pay first attention, above speed and everything else, to the absolute safety of installation of the gasoline plant. It can be made safe as far as any ordinary thing can be made safe. It rests with the engine maker, the builder, and owner, to make the gasoline launch safe and satisfactory until we have something metter. The paper is rather notable in one way, in that the writer was virtually the owner of the boat, and also the designer and builder. It is so rare that a designer goes to sea in his own boat, that what he says ought to be well worthy of consideration.

The president: If there is no further discussion, the chair will announce that the customary vote of thanks is extended to Mr. Stearns for his interesting paper.

The meeting then ajourned until Friday morning.

FRIDAY MORNING'S SESSION.

At the opening session on Friday morning Capt. William Hovgaard, in the absence of Prof. W. S. Leland and H. A. Everett, read the paper entitled "Test in the S. S. Governor Cobb." This paper is given in full because it is necessary to do so in order to render the subsequent discussion intelligible to the reader; but

no paper ever read before the society created such a storm of criticism for inaccuracy and incompleteness, and there was serious talk of striking it from the transactions. The paper follows.

TEST ON THE GOVERNOR COBB.

The test on the S. S. Governor Cobb, of the Eastern Steamship Co., was run by the Massachusetts Institute of Technology to provide thesis work for some of the graduates in the department of naval architecture.

The test was run on the regular trip of the Cobb from Boston to St. Johns, via Portland and Lubec. Observations began on passing Boston light and were continued for 26 hours; for the boiler test continuously; for the engine test at favorable times.

All observations were plotted, which presents an interesting study of the results and makes simultaneous readings possible with a limited corps of observers. The close agreement of these curves is a good check on the accuracy of the observations.

Time has not permitted the preparation of a complete report, but merely a summary of that portion of the test run at full speed under the most favorable conditions.

The horsepower was determined by means of the Denny and Johnson torsion meter belonging to the U. S. S. Chester, which was loaned by the Bureau of Steam Engineering, Navy Department, through the courtesy of Admiral Charles W. Rae, chief of the bureau. The details of the loan were arranged by Benjamin C. Bryan, lieutenant-commander U. S. N., who gave the matter his personal attention and accompanied our party on the test.

The torsion meter was set up in the engineering laboratory and a thorough working knowledge obtained by the use of experimental apparatus, before installing the meter on board. Thirty-six feet on the side shafts, and 49 on the center shaft between inductors, was the greatest length obtainable which gave a meter reading of about 0.50 and 0.73, respectively, at full power.

In computing the horsepower, 1.506, based on an assumed torsional modulus of elasticity of 11,600,000, was used for the constant K in the formula—

$$\text{H. P.} = \frac{Kd^4rR}{CL},$$

in which d = diameter of shaft in inches [(6⅛).
r = torsion meter reading.
R = revolutions per minute.
C = inductor constant (12.5).
L = length of shaft in feet between [inductors.

The water consumption was measured by a Hersey hot water meter loaned by the Hersey Manufacturing Co. of South Boston. It was installed in the suction line between the hot well and the feed pump and gave exceedingly satisfactory results.

This meter was later calibrated under similar conditions, the curve in Fig. 1 showing the percentages of error. The plot of meter readings was struck in as a straight line showing practically a uniform rate of consumption, no point varying from the line by a quantity greater than 1 per cent of the total.

The steam for all auxiliary purposes was passed through the two auxiliary lines, one on each side of the vessel, and the quantity measured by its flow through orifices. A thin steel plate having a hole 1⅝ in. in diameter was inserted in each auxiliary line between two flanges near the boiler. Pressures were read simultaneously at both orifices and at no time showed a variation of over a pound after making the proper gage corrections.

The orifice was afterwards set up in the laboratory and its coefficient carefully determined by actually weighing the condensed steam under conditions similar to those on the boat.

Several buckets of coal were weighed and their average, which varied only 10 lbs. from either maximum or minimum, multiplied by the number of buckets was taken as the coal consumption. The plot of coal consumption, like that of the water, is a perfectly straight line showing a uniform rate.

The run from Boston to Portland was largely consumed in a progressive trial, the speed being taken by a stop-watch and a McGray electric log towed from the end of a boom well clear of the wake. The log had previously been calibrated by towing over the measured mile.

Results of speed and power are shown in the curves in Fig. 2.

The best run was made at full speed between Portland and Lubec, under the most favorable conditions of weather and sea. All observations were taken at 10-minute intervals, except the coal, which was recorded every 15 minutes. Fig. 3 shows the chief records during this run.

An attempt was made to determine the quality of steam, but as there were objections to tapping the main pipe a sample was taken from the drip connection which showed 2.5 per cent of moisture, which is more than would be obtained from a fair sample.

It may be of interest to compare the following tabulated results with similar results obtained from a test on the S. S. Nantucket of the Merchants' & Miners' Transportation Co.

RESULTS OF TEST.

	Nantucket.	Cobb.
Date of test	Feb. 7, 1904.	April 18, 1907.
Duration of test—boiler	20½ hrs.	8 hrs.
Duration of test—engine	20½ hrs.	4 hrs.
Boiler pressure (average gage)	147.3 lbs.	128 lbs.
Quality of steam (sampled at drip)	98.8	97.3
Barometer	14.7 lbs.	14.7 lbs.
Temperature of air pump discharge	.....	110 deg. F.
Temperature of feed water	209.4 deg. F.	213 deg. F.
Kind of coal used	Georges Creek.	Cape Breton.
Moisture in coal	2 per cent	1.9 per cent
Ash and clinker in coal	7.6 per cent	6.8 per cent
Draft at blowers	Natural.	2.1 inches.
Number of boilers (single-ended Scotch)	4	6
Total grate surface	320 sq. ft.	323 sq. ft.
Total heating surface, approximately	10,150 sq. ft.	12,000 sq. ft.
Coal fired per hour	5,135 lbs.	8,050 lbs.
Water fed per hour (average during engine test)	45,844 lbs.	85,710 lbs.
Coal burned per square foot grate surface	16 lbs.	24.64 lbs.
Maximum revolutions	.....	P. 475, S. 460 C. 400
Corresponding total shaft horsepower	.....	4,100
Average revolutions	74.05	447
Average total horsepower	2,362	3,747
Steam for auxiliaries	.....	38,360 lbs.
Steam per H. P. per hour, total	19.41 lbs.	22.87 lbs.
Steam per H. P. per hour (propelling machine only)	.....	19.74 lbs.
Speed (average)	15.00	17.21 k.
Type of engine	Reciprocating.	Turbine.
Vacuum in inches	25	27
DIMENSIONS.		
Length between perpendiculars	274 ft.	290 ft.
Beam moulded	42 ft.	51 ft.
Draught	15 ft.	14 ft.
Displacement	2,700 tons.	

COMMUNICATED DISCUSSION.

Andrew Fletcher, president W. & A. Fletcher Co,: I regret exceedingly that business engagements will prevent my being present, as requested, when Prof. Leland and Mr. Everett's paper is read. I think it is very unfortunate that the paper should be presented at all, for many of the statements in it are not fair to the Governor Cobb and are most indefinite. In fact, to my mind, the paper could almost be considered but a memorandum of a test. As the Governor Cobb was the first Parsons turbine ship built in this country, the report of her test will probably go out to the general engineering world as though it was her best performance, not only as to economy but also as to speed, and a more careful and complete test should have been made.

Some months ago we received a letter from Prof. Peabody, stating that he intended to make a test of the Governor Cobb, and requested that we loan him the lines of her hull. This we declined to do for business and other reasons, but stated in regard to the test that we would be very glad indeed if he would let us know when the test was to be made and to give us two or three days' notice and we would have a representative on board at the time of the test. Evidently our refusal to loan the lines of the hull was very disappointing, for we received no reply to our letter from him or from any of his assistants, neither did we receive any notice of the test.

Tests, as you know, are generally made under fair, if not the best conditions, but in this case, we know, in comparison with what the Governor Cobb has done, that the preparations for and the operation of the test must have been most incomplete.

As the line shafting of the engine was not tested, it was hard for them to assume a torsional modulus of elasticity. We all know that assumptions are sometimes wrong, and this, of course, would affect the horsepower given. A comparison is made between the steamer Nantucket and the Governor Cobb's horsepower. Was the Nantucket's horsepower obtained in the same way as the assumed horsepower of the Governor Cobb, or was it indicated horsepower? This is quite important when a comparison is to be made.

It would be very interesting to know how they had previously calibrated the McGray electric log. Had it been towed over a measured mile at the stern of the Governor Cobb, or had it been towed over a measured mile from another steamer, a steamer of a lesser speed? We all know that logs are not always reliable, and that a log showing relatively correct under low speeds, as the speeds are increased will very often fall down and the results are therefore not always relia-

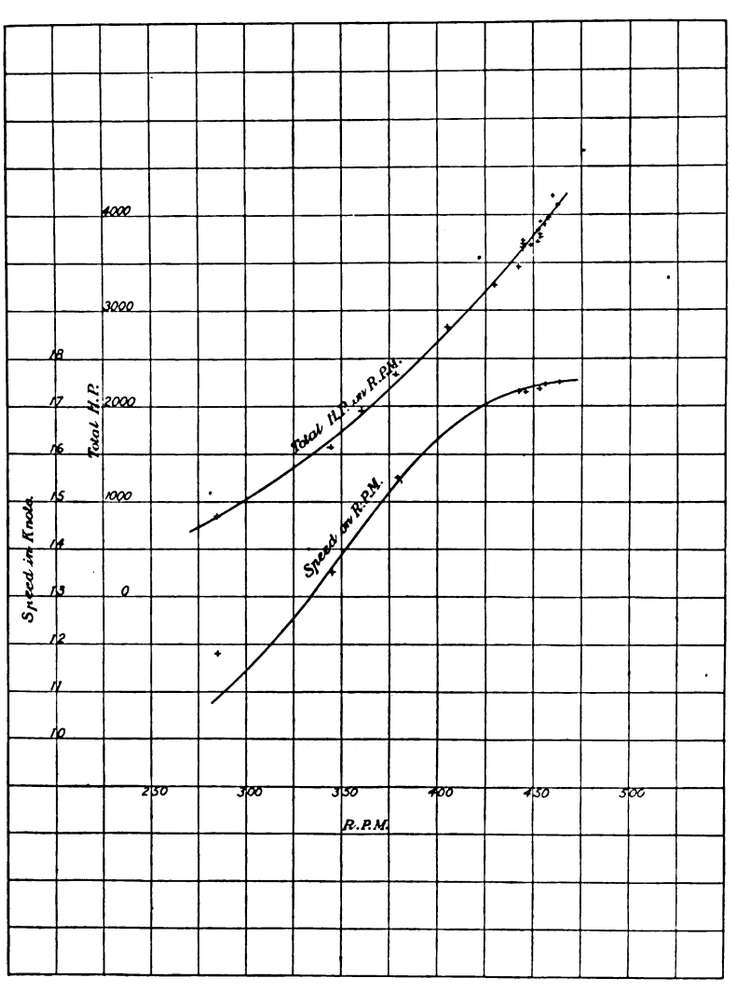


FIG. 2.

ble. Their diagram of the speed on the R. P. M. shows that the wheels started to lose their efficiency at about 17 knots, and at 17.6 knots the curve is absolutely flat. This, we know, is absolutely wrong from curves that we ourselves have made on other performances over known distances, so that we are convinced that the curve presented is not correct, and that their log absolutely fell down at the higher speed.

We should think also that in presenting a paper that would necessarily attract as much attention as this one, as this steamer was the first turbine steamer built in the United States, that they would have given more of the conditions under which the tests were made. No data is given as to draught and trim of the vessel.

We also note that the boiler pressure during the test was 128 pounds. As this is 22 pounds below the working pressure of the boilers, which could have been maintained, this of itself would in a measure affect the economy.

We note also, for the four hours' test of the engine, that the average revolutions given are 447. On the first run of this steamer from our works to Boston, with a green crew and only two of our staff on board, one in the engine room and one in the pilot house, for 14 hours and 25 minutes, the average speed was 18.12 knots per hour, and the average revolutions per minute for the whole time were 459.3, which to our minds is convincing proof that the tests as given were not made under the most favorable conditions obtainable.

The paper is very interesting from the remarkable evaporation efficiency of the boilers, which give an evaporation per pound of coal of 10.65 pounds of water, whereas in the case of the Nantucket's figures the evaporation per pound of coal is 8.92 with Georges Creek coal. It must have been remarkable coal in the case of the Governor Cobb. If, however, the evaporation figures are not correct, that, of course, would very materially affect the water consumption of the engine. We can hardly believe, considering the coal, that the evaporation figures given are correct, so that considering all the circumstances, while the paper is an interesting one, it is nevertheless so incomplete, that in my opinion it should not be published in the reports of the proceedings of this association as a complete and accurate test of the steamer Governor Cobb's performance.

D. W. Taylor: The information given in this paper is very interesting and instructive. The figures given for water consumption seem to be somewhat higher than some of us had hoped for as a result of the adoption of turbines. Presumably, however, the horsepower per hour is brake horsepower in the case of the Governor Cobb and indicated horsepower for the Nantucket. If this is the case, the water consumption of the turbine makes a favorable showing as compared with the reciprocating job.

The conditions of trial were obviously unsuited for the reliable determination of speed, and I hope the builders of the Governor Cobb may see their way to supplementing the information given in this paper with some results of measured mile trials for incorporation in our transactions.

The curve of speed plotted upon revolutions given herewith is radically different from any other such curve that I can now recall. If it correctly represents the observed data, it would seem to cast grave doubt upon the reliability of the log used. Examination of the curve will show that an increase of 50 revolutions, from 300 to 350, gives an increase of speed of almost 2½ knots, while at higher revolutions an increase of 50 revolutions, from 425 to 475, would involve an increased speed of ½ knot only. True, the average revolutions are those of three screws, of which one is working under conditions very different from the other two, but, after making all allowances, the excessive increase of slip with speed appears incredible even upon the supposition that this is a case where cavitation—that bogey of the turbine propeller—is doing its worst.

If the builders of the Cobb could furnish for our transactions a curve or curves of revolutions and speed from measured mile trials, which would not be subject to the doubt of data obtained from a towing log, they would add greatly to the value of this already valuable paper.

Charles B. Burleigh, General Electric Co., Schenectady, New York: I was unfortunately obliged to be out of town yesterday and in consequence did not receive copy of paper No. 9 until the 20th instant, and regret exceedingly that the time is so limited. I also regret that I

shall be unable to discuss the paper in person. In going carefully over the paper, however, I feel that little can be said in discussing the test itself, particularly in view of the limited time at my disposal. The writers are certainly to be congratulated for the conditions making possible the comparison between the performance of the steam plants on the Nantucket and Cobb, and while the pressure and quality of the steam are in favor of the former, the vacuum and speed are in favor of the latter, which undoubtedly results in conditions, to say the least, not unfavorable to the turbine. While the hull and propeller design are in part responsible for the speed, a comparison of the speed and steam consumption is interesting.

The Nantucket's average water rate of 19.41 lbs. per I.H.P. resulted in an average speed of 15 knots, or 1.29 lbs. of water per knot; the Cobb's average water rate of 22.87 lbs. resulted in an average speed of 17.21 knots, or 1.32 lbs. of water per knot, or approximately 2.4 per cent in favor of the Nantucket.

From the fact that the port, starboard and center turbines were operated at varying speeds, one is led to infer that the turbines were not operated at maximum speed throughout the test. If this assumption is correct, it would undoubtedly account for the apparent deficiency in economy. This would raise a point worthy of careful consideration as to the efficiency of the turbine unit under speed conditions varying widely from designed speed. It is, I believe, generally conceded that there is little room for argument as to the superiority of the turbine under designed speed conditions.

These conditions are tending toward the investigation of methods whereby the output of the turbine can be utilized for actuating other apparatus through the medium of which propellers may receive their energy, under such conditions as will permit the operation of the turbine, or turbines, at all times at designated speed irrespective of the speed of the craft in which they may be installed.

One method which is being carefully considered for the accomplishment of these results is the use of the steam turbines direct connected to electric generators delivering the current thus generated through the medium of wires to motor, or motors, direct connected to the propeller. Let us briefly enumerate the advantages resulting from such an equipment.

First. Complete control of the craft is located in the pilot house or on the bridge.

Second. Maximum efficiency is maintained at all times, regardless of the speed of the vessel.

Third. Any speed of the craft is available from maximum to maximum in either direction.

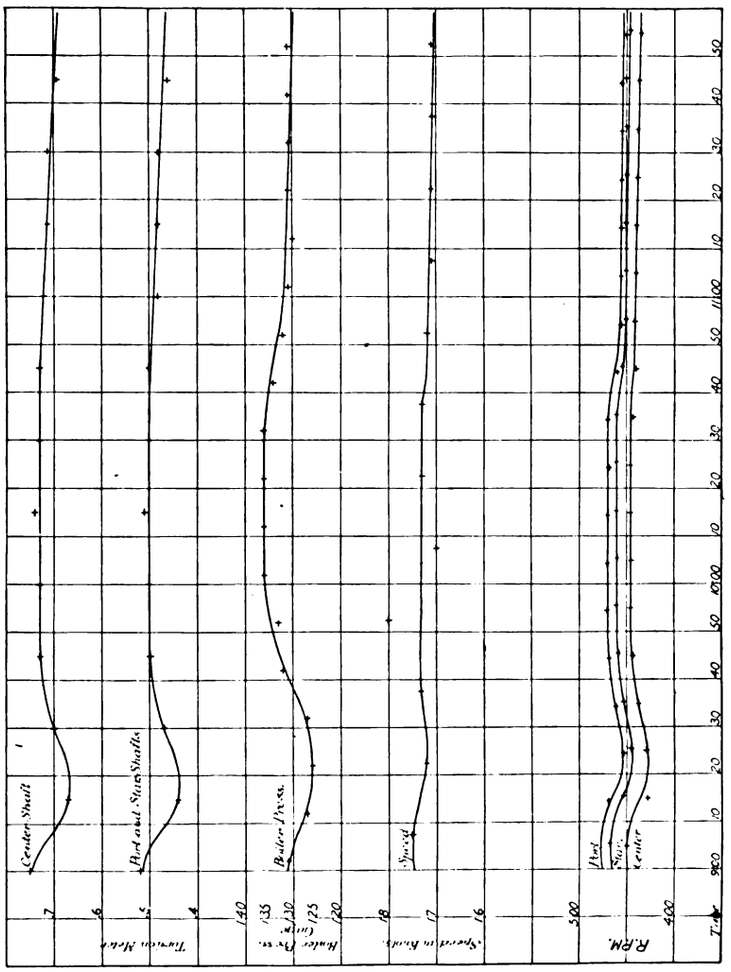


FIG. 3.

Fourth. With double screws where quick maneuvering is desirable one may be rotated at any speed in one direction and the other in any speed in the reverse direction, thus assisting the rudder in quick maneuvering.

Fifth. The prime movers may be installed in as many subdivisions as the design of the hull makes desirable, and located without reference to the shaft.

Sixth. The weight of the prime movers may be so distributed as will best meet conditions of design.

Seventh. Where subdivision of prime movers is adopted, complete disability is obviated.

Eighth. The shaft space is made available for freight or other use.

Ninth. High speed turbines with generators and motors occupy less space and weigh less than large slow speed turbines.

Tenth. The efficiency of high speed turbines is, on general principles, better than on slow speed units of corresponding output.

Eleventh. Net efficiency at varying speed of craft is superior by this method.

Against the above eleven items of gain we have the first cost, on which I have at present no figures available for comparison, but am of the opinion that when the comparatively inefficient small electric generators used for auxiliary work aboard a marine craft are omitted as being unnecessary with this system, thus reducing the boiler and condenser capacity, I am inclined to feel that this item will not be a serious drawback to its consideration.

Again, where it is desirable for a craft to operate other than at maximum speed a large part of the time there is no question but what the net efficiency is in favor of the transformation of the mechanical energy of the turbine to electrical energy and again back to mechanical energy, and the consideration of the subject from conditions of maximum speed of the craft worthy of careful investigation as regards efficiency.

I trust you will pardon my temerity in advancing this phase of the subject for your consideration, but the further I investigate it the more attractive it appears and I feel that it is

worthy, at least, of your careful investigation.

I thank you for the opportunity of discussing this paper, and regret my inability to be with you.

Mr. Lewis Nixon: I am sorry I got in after a good deal of the discussion had taken place, because I was very anxious to participate in this discussion. I do not want the impression to go abroad that I would withhold in any way the admiration which any man must feel for the wonderful work which has been done with the turbine engine. All I have sought in any little work I might do in relieving the world from the thralldom of a steam-propelled vessel would be in the direction of bringing about that desirable result. I have not been able to find the deadly parallel placed upon the turbine engine, as I had hoped. This comes nearer to it than anything I have found. The turbine engine has, of course, a great many advantages. It works fairly well under a good many conditions. All of us who knew the late Mr. Younger, of Cramps, one of the foremost engineers, I think, in this world, will remember a pat saying of his. He used to tell us, when we would pat ourselves on the back and do pretty well on trial, and come back and say, "Well, those engines worked pretty well," he would say, "It is a damned poor engine that does not work very well on trial."

A great idea with the people who do not understand turbines is that the economic conversion of power is somewhat insufficient, and those who know to the contrary will not be stampeded along those lines. This particular parallel column, if it is correct—there are a few discrepancies, and I have not quite full advantage of the discussion—would seem to bear out the somewhat striking superiority for the reciprocating engine. The writer does not tell us how often he cleaned fires during the trial, but if he has ash and clinker in coal of 7.6 per cent in one and 6.8 per cent in the other, in the running of the Cobb in four hours he had only 2,200 lbs. of ashes to take care of, while in the other boat he had 8,000 lbs. of ashes to take care of, necessitating a very decided cleaning of the fires, which, of course, would interfere with the efficiency. Then again, it seems to me, that the boiler in the case of the Cobb is vastly superior, practically the same amount of grate, with very large heating surface to take heat out of the coal, and with an assistant draft as well, and yet even with these advantages, we find that the coal burned per horsepower is about the same under the two conditions. Of course, you have more speed, but that really has not anything to do with it, as you have considerably more power. I understand there have been exhaustive trials made by the Crafts, with two freight boats with reciprocating engines and one boat with turbines. Their data is probably very reliable, and I shall say that I wish I could get it, because I am looking for all the light I can get, and it is for the interests of all engineering societies to have the freest and fullest discussion, and if the merits are as stated there should be some direct and positive proof of it for the engineering world.

There is not much here that seems to show to the direct advantage of the turbine engine. I do not think that these are absolutely definite figures, as an evidence of the advantage of the turbine and reciprocating engines, this is simply a case where we can compare in a technical way the advantages or disadvantages of the two systems, and as I have been told a great many of the seeming discrepancies have been already pointed out, I shall not take the time of the society to go further into that feature of the paper.

As regards the last communication read by the secretary, the one from Mr. Burleigh, you must remember that all of us who have been around the naval department must feel now, probably when we laughed at some of the predictions and some of the plans which Mr. Bagdon presented to us many years ago, one of which was the idea of having many screws along the side of the vessel propelled by motors driven from a central station, we were laughing at a man who was seeing further into the future than we could see, and there is no question but that many of the ideas which he presented will be approved by the engineering world sooner or later. He was turned down very flatly ten years ago, and today the things which he proposed are put forward for serious consideration, and many of them are being seriously considered by prominent naval architects and engineers throughout the world.

Mr. F. M. Wheeler: I quite agree with Mr. Fletcher that this should be considered more as a memorandum than as the result of tests to be published. Certainly the paper is not very complete, to say the least, and therefore is apt to be very misleading. Turning to page 4 we find it definitely stated what was the speed per horsepower per hour for each of the ships, but when it comes to the net, in the case of the Nantucket, it is left blank. Of course, we can readily figure that out. However, in the case of the Cobb, the figures show that the auxiliaries took about 15 per cent of the total amount of steam. Now, if you will notice, there was a difference of 2 in. in the vacuum, and we all know, who have had experience with air pumps, to get an inch or two more of vacuum requires a considerable excess of power over the lesser vacuum. In other words, we can readily double up or treble the horsepower of the air pump to secure the difference. Then, again, there are the blowers in the case of the Cobb, which were not used in the Nantucket, all of which shows that the auxiliaries aggregated a large amount of horsepower. Assuming, however, that the auxiliaries were about the same percentage in each case, it would bring the steam per horsepower for propelling the machinery of the Nantucket down to about 16.5, or a little less, pounds for indicated horsepower. Now, you can compare that with 19.74 for the turbine engine. I think it is a pity that these figures are not more complete, because it is very misleading.

I might say right here that on one of the trips of the cruiser New York we made a very interesting test about ten years ago or more, of the air pumps, to find just how much more power they required to get an inch or so more of vacuum, by stages of, I think, half inch vacuum—that was the indication of the pump—and it was very surprisingly great. There was quite a margin between, for instance, 25, 26 or 27 in.

Mr. James G. Winship: Mr. President and Gentlemen; There is one point in this paper I would like to call attention to, in relation to the vacuum and the temperature of the feed water. If the temperature of the feed water is 110° and the vacuum is 27 in., it is all right. We all know, if we do know anything about it, that the condensers and air pumps in that boat were arranged for a good deal more horsepower than was developed on that test. It looks to me as if the engineers who were running the engine might have been fooling these young men; everybody who knows anything about the practical part of the work knows that sometimes an engineer on watch can give these college fellows the benefit of their experience, and we know very well that 27 in. is a very low vacuum for that boat, especially in the latitude in which the boat was running. If the water was very cold there they could

easily have speeded up the circulating pump and air pump and got a great deal better vacuum than that. I made a trip on the Harvard a little while ago and they had four gauges on the engine and each one of the gauges was showing over 29 in. of vacuum, and each one was showing a higher vacuum than the other, simply because the air pump was running faster on one engine than on another. On one engine the gauge showed 29.5 in. of vacuum, and on another engine the gauge showed 29 in. of vacuum. I hardly believe that was true, that the gauge was correct, but the young man who was on one watch wanted to show me they were perfectly correct. I did not blame him for making the statement. I was glad to know it was so, because it was showing up pretty good. I do not doubt but what this engine was capable of developing a higher vacuum, which would have made a much greater economy in the steam used in that engine.

Mr. E. H. Anderson: I would like to make a remark or two about the figures. As regards the boiler pressure, this is given in the test as 128 lbs. Then on page 2, again it says: "The best run was made at full speed between Portland and Lubec, under the most favorable conditions of weather and sea.'" It would appear to me that the boilers were dirty, and for this reason the boat left Boston and by the time it left Portland it had been running eight hours. This would account also for the boilers requiring the 2 in. of air pressure. I think it is unfortunate that none of the turbine pressures are given, as you cannot arrive at what the turbines were doing at all. As regards the total shaft horsepower, it is given as 4,100, on page 3, and the maximum revolutions, port 475, starboard 460, and center 400. On the last curve on the last plate the revolutions are plotted. You will see that the port one makes an average of about 470, the starboard about 455, and the center one does not go down anywhere near 400, but the average would be about 440. As the horsepower is calculated by the formula given at the top of page 2, it shows a discrepancy, as the revolutions for the center shaft were taken at 400, instead of 440, so that 4,100 shaft H. P. should be 4,300. That alters the water consumption per horsepower.

Captain Hovgaard: The question of Mr. Fletcher and Mr. Taylor about the quality of the horsepower I have already answered when reading the paper, stating that for the reciprocating engine it was indicated horsepower, for the turbine engines it was brake horsepower. Not having been in any way connected with the experiment, I must leave the answering of the other questions to the authors of the paper.

The President: It is unfortunate that the authors of the paper are not present to supply the information lacking to render this paper of use and value, and it seems to me that the chair is justified in severely criticising an institution of the standing of the Massachusetts Institute of Technology that should present a paper here in such condition.

Mr. John Platt: Mr. President, if Prof. Leland had been present, I should say a good deal more than I will say now, but as to what you said I would like to say this—that this paper is so absolutely misleading and the data which you have suggested should be contained in the paper has evidently not been taken, and the data which has been taken is not correct in very many particulars, and in the particulars in which it has been taken is so very far from correct, so much so, that I do not think this paper should be printed in the proceedings of this society, and I think some means should be taken to prevent the paper being printed and having the society stand for such a paper. I had always understood that papers put forward by students and fathered by the professors were supposed to be in this country very full and correct, and from attending meetings of this society and others I am sure, generally speaking, this is so, but no one who has had to do with tests and trials, and has gone through this paper will say that more than three-quarters of the particulars that should be given are given, and it does not give any sufficient data in regard to the tests of the turbines. No turbine particulars are given, no pressures are given, and really no data is given which will enable any engineer to get any information whatever with regard to the working of these turbines. I do not know whether a motion is in order to the effect that the paper be not printed in our proceedings, or whether it is something which should be left in the hands of the council.

Mr. R. R. Row: I heartily agree with Mr. Platt, and if it would be in order, I would offer a motion that Prof. Leland and Mr. Everett give us the necessary information to complete this paper, in order that it may be embodied in the next issue of our proceedings, but I do not believe it would be well to keep what we have out of the next book of transactions. Of course, I am quite willing to leave this matter to the consideration of the council, to take means to supply the data that would be necessary in accordance with Mr. Platt's suggestion, which we all believe is correct, and in behalf of Prof. Leland I will say that I believe he would be only too glad to do it in order to make the paper complete.

Mr. William Hovgaard: I am very sorry that I am unable to give any additional information to this paper. I have, however, no doubt that this experiment has been carried out scientifically and objectively, and that the authors have good reasons for whatever incompleteness may be found in the data given. I would not in any case consider it fair in the absence of the authors, and before their reply has been heard, to take any such action as is proposed.

Mr. F. H. Wheeler: I am inclined to disagree with Mr. Platt about taking such extreme measures. I think it simply reflects on the publication committee, or whoever is responsible for putting it before us, and therefore, taking that into consideration, I think we might let this paper pass along until the next meeting, perhaps, or something of that kind, without taking any very extreme action in regard to it.

Mr. F. L. DuBosque: It seems rather unfair to pound the Massachusetts Institute of Technology. I and all of us know they are doing everything they can to advance the science of naval architecture in this country, and we all know they have been very successful in doing it. Our proceedings contain a great many papers with less complete data than is contained in this paper, and probably less accurate. Those who have attempted to make trials of merchant ships know that they have found themselves up against a very stiff proposition. The people who are trying to earn money with these ships are not going to place them at the disposal of investigation societies, unless it does not interfere with their earning capacity. I appreciate that the coal reports which we have here are very misleading, and the other data is very misleading, but for that reason we must not blame Professor Leland or any of his associates. I think he has done the best he could with what he had available, and he has given us more on the performance of the steam turbine vessel than we have ever learned before. We all admit we have been trying to get data on the steam turbine vessels and cannot get it. Now, he has given us a little bit, and

let us accept it in the spirit in which he has given it to us.

The President: The chair will close this discussion by stating that it has the responsibility and the desire to be fair and impartial in this matter, and the society will realize that the representatives of the Massachusetts Institute of Technology will probably receive and regard a little castigation from him in good part. However, it is fair to point out that whatever is in the paper, whatever has been omitted from the paper, the paper has been published in time to give every one a fair opportunity to fill the gap.

THE VERTEBRATE PROPELLER.

A well known Cleveland consulting engineer, discussing the above subject, referred to in the REVIEW of December, said:

"Few contrivances have had the disinterested and gratuitous attention of inventors that has fallen to the lot of devices for propelling ships. Probably few have been the subject of such painstaking and costly investigation, not only because of the vastness of the affected interests, but because of the intricacy of the problem and the impossibility of observation of actual conditions.

"All progress has been the result of experiment and deduction and oftentimes apparent definite conclusions are entirely upset by a trifling change or modification of a seemingly insignificant detail or of some one or more of the conditions of working and, conversely, seemingly wide latitude appears permissible in others without affecting net results. So it frequently happens that a 'new' design is brought forth, which careful research would have shown to be merely a threshing over of old straw. Many of these lose sight of the fact that a ship is not merely a vehicle for carrying some particular mechanism, which, viewed simply as a mechanical movement or a means of utilizing or developing power, may do what is claimed for it, but she is primarily designed to transport something, which may be light and bulky or embody great weight in condensed form. She must be as far as possible an independent unit capable of operation under adverse conditions at a distance from outside sources of assistance, and not dependent upon peculiar or particular conditions, save that she must be watertight and have sufficient water in which to float. Her motive power, therefore, must combine the least possible space and weight and so far as external details are concerned, not be affected by slight contact with bottom or sides of shallow or narrow channels or with other objects, such as other ships. It must not be of a type which requires a certain least depth of water under her bottom, or demand a construction which complicates the handling or stowage of cargo, or that the entire bottom of a ship be accessible to effect examination or repairs. As the surrounding water furnishes the only resistance to which the power may be applied to effect movement, so it follows that the propeller must move a weight of water through a given distance, greater than the weight of the ship moved through the same distance in the same length of time, or, a lesser weight of water through a greater distance, otherwise there can be no motion. These differences vary, but not in the same degree, with the speed at which the ship is driven. Hence it follows that once the water has been set in motion, it should not come again in contact with the ship or propeller if it can be avoided, otherwise some part of the effort expended in moving it is lost. For this reason continuous paddles, such as the endless chain or belt propellers, and screws having a more or less continuous surface, have been found inefficient. One of the earliest applications of the screw (the Archimedes, in 1838) developed the fact that after a large portion of the helix was broken away by accident, the speed of the ship was greatly increased, and led to the construction of the screw much as we now have it, with a number of comparatively short sections of helix. Yet this continuous screw is frequently revived, with apparently no better excuse than that if a relatively narrow blade is good, a continuous must be better.

"As the earlier, and some of the present, experimenters with flying machines, worked on the theory that a successful machine must embody the principles on which birds are supposed to be constructed, so some of the early designers assumed that the fish provided a reliable model for vessel propulsion. Leaving aside the question (unimportant from the inventor's point of view), as to the proportion of the whole structure devoted to means of propulsion in the bird and the fish, the fact remains that the fish propeller was proposed upwards of forty years ago, as the records of the patent offices bear witness. That the inventor of the propeller described in the REVIEW of Dec. 5 is of the opinion that the fish propels himself by means of a sinuous movement of the entire body seems evident, yet as the opportunities of examining a fish under full headway are, to say the least, limited, and practically restricted to a few examples, such as the porpoise and shark, it seems to be making him responsible for a good deal that is by no means certain. I have watched the shark and the porpoise for long periods without detecting any sign of movement of any part but the tail, and the porpoise, it must be admitted, is a rather fast sailer.

"The screw propeller, as now generally fitted, fulfills more nearly the conditions required in a propeller, and before referred to, than any other device, and represents the result of concentrated effort and vast expenditures of money on promising models including the fish. This merely by way of a general discussion of the subject; to suppose that any form of propeller located in or under the bottom of a ship, even though demonstrated to be feasible, to say nothing of such a form as that described, would be given a moment's serious consideration, only illustrates how easily people may deceive themselves."

THE Y. M. C. A. SCHOOL OF NAVIGATION.

Commencing Dec. 16, the Young Men's Christian Association of Cleveland, Prospect avenue and E. Ninth street, is to open a school of practical lake navigation, for masters, mates, wheelsmen, watchmen, and all others desiring to qualify themselves in this study. Clarence E. Long will have charge of the school.

The school of navigation is only one of a great many activities carried on by the Young Men's Christian Association of Cleveland. Besides this course of study there are more than forty others of practical nature ranging from elementary English and writing to higher mathematics, engineering, drafting and design. A new term in these subjects will open Jan. 6, which will make a very convenient opportunity for students in the school of navigation to take any of these subjects in connection with their study of navigation. The institute is a large school in itself numbering over 950 students.

The association is many-sided. It aims to develop not only the intellectual side of men in its educational work, but also their social, moral and physical natures through its other departments. It is a composite of school, gymnasium and social club. The parlors, lobby and reading room make a most congenial place for men to meet and exchange conversa-

tions. Men from the lakes who are not employed during the winter will undoubtedly find this an attractive feature. The rooms are most comfortably and cheerfully furnished. The reading room is supplied with about sixty of the best papers and magazines published. They include daily papers from all the principal cities, weekly publications and monthlies devoted to fiction, current topics, popular science, engineering, travel, business, the trades and navigation. All of these features will be furnished free to the students in the school of navigation.

Then there is the gymnasium with its swimming pool where the swimming is good the year round, its shower baths where the water can be tempered to suit every man's taste and lockers provided for member's clothing. The gymnasium furnishes an opportunity for men to gain or retain their health. There are a large number of classes in session every day. Besides the regular class work on the gymnasium floor there is plenty of recreation. The physical director believes that wholesome fun is an important element to be considered in connection with exercise, so there are games which are devised to employ all the different sets of muscles which a man should exercise and at the same time give a man good rollicking fun such as he enjoyed when he was a boy. Some of these games are hand ball, basket ball, indoor base ball, medicine ball, etc.

Another feature of the association which has not been mentioned is its employment department. In this department two men give their entire time to finding positions for members and employes for business men. Every year more than 1,000 positions are filled in this way. All these features will be free to students in the school of navigation except the gymnasium. An extra fee of $6 per year is charged for this privilege. A membership ticket from the Cleveland association will be good in any of the associations of other cities.

Altogether it seems that with the splendid facilities which the school of navigation will offer and the numerous other privileges of the association in addition that a lake man will find association institute a most profitable place to spend their spare time during the winter.

Clarence E. Long, who will have charge of the school of navigation, is well qualified for the position as there is probably no other man who has devoted as much time and study to lake navigation, and, too, there is probably no other man who knows the wants and needs of the lake mariner better than he. Mr. Long has had many years' experience as a teacher and it was while conducting such a school in Milwaukee, that the need of a simple and yet comprehensive text book on the art of navigating a ship on the great lakes according to the scientific principles, suggested itself. His nautical magazine was the result. This book is now the standard work for lake navigators and there is more of them in use than all the other works put together. Simplicity and clearness are manifest throughout its pages, and its aim is to instruct the beginner, leading him from the first operations to the perfection of the art as found in any standard work on navigation. The book was written as clearly as possible and in minute detail, especially the little things to which so many writers pay no attention, but which are really the stepping stones to successful learning and so indispensable to the beginner. The originality of Mr. Long's methods, the simple rules for solving the various problems, and the correct principles on which they are based, have been greatly appreciated by the lake nautical profession. Mr. Long has ever dealt with the science in such a commonsense, practical and business-like way, as to make the once abstruse calculations appeal clearly to the intelligence of the sailor, who, as a rule, is a stranger to the various formulas given in almost all works on navigation. The scientific formulas upon which the various problems are based are not considered, but clear, common-sense explanations are given in their stead, so that the subjects become intelligible and are adapted to the needs, both of men with a limited education and those of technical training.

As a teacher of navigation Mr. Long attributes his success to the fact that what knowledge he possesses of navigation was picked up by him without the aid of a tutor, and to do this and succeed required a great deal of study and perseverance. What he learned he worked hard for, and when one gains knowledge under such trying conditions and circumstances, it stays by him, because it is not acquired by mere matter of form as is too often the case. Then to put the study into practice proves conclusively that he has a thorough knowledge of what he learned. Being thus situated Mr. Long is naturally adapted to impart this knowledge to others, and to clear the way of obstacles that proved stumbling blocks to him. His great point in all his work is simplicity and practicability, thus leading the student directly and easily to a clear comprehension of the steps in the various solutions and the necessity for them. The "whys" and "wherefors" of the operations are explained as well as the "hows." By this means the student is led to employ the simplest methods of solution because they are generally natural methods, and to explain every step in the process. A student who has been trained in this manner will never forget a process or rule, because he can devise the process and frame the rule at will.

The beautiful point of Mr. Long's instructions is that he has his own special books and devices, and these are used in the school as the text. The advantage of this is ten-fold, one and the most important being that the student may have the school's course of instructions at his disposal ever afterward.

There will be a regular course of navigation including every subject that is of practical worth to the lake mariner, and in addition to this other special studies will be given when desired. There will be no classes, each pupil to be taught individually; in other words, one can start at any time and on any subject, and can come and go as he wishes. This does away entirely with class embarrassments and permits one to go along at his own "gait." This is to be an important feature of the school.

CREW OF FOWLER EXONERATED.

As the result of a trial conducted by United States Inspectors Waltz and Hodge, of Memphis, Tenn., the officers and crew of the steamer Dick Fowler were exonerated from the charge of reckless navigation, which it was alleged endangered the life of the president during the trip from Cairo to Memphis on Oct. 3. The Fowler had on board the Cairo delegation to the Deep Waterways convention at Memphis as well as Congressmen George W. Smith and P. T. Chapman, of Illinois, and J. J. Russell, of Missouri. Congressman Russell was the first witness called and he testified that at no time was the distance between the president's steamer and the Dick Fowler less than 50 ft., and that at all times Capt. Mark Cole, who was commanding the Fowler, and the crew, showed great care in handling the boat. His testimony was affirmed by many other witnesses, with the result noted.

The second-class battleship Texas, the first armor-clad vessel of the modern navy, has been placed out of commission at Norfolk navy yard, having been in reserve for more than a year. Since the opening of the Jamestown Tercentennial Exposition she has been at anchor in Hampton Roads. It has not been decided what disposition will be made of her but several states have asked that she be assigned to them for the use of the naval militia.

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MERCHANT MARINE LEAGUE CONVENTION.

The Merchant Marine League of the United States will hold a convention in Cleveland on Saturday, Dec. 21. The convention will be presided over by ex-Governor Myron T. Herrick, and among the speakers will be Mayor Tom L. Johnson, of Cleveland; Lyman H. Treadway, president of the Cleveland Chamber of Commerce; Hon. T. J. McCleary, second assistant postmaster general of the United States; Hon. Truman H. Newberry, assistant secretary of the navy; Congressman W. E. Humphrey, of Washington; J. G. Butler Jr., of Youngstown, and F. E. Case, president of the Harvard company, of Canton. In the evening the league will tender a banquet to Senator J. H. Gallinger, of New Hampshire, and Senator J. B. Foraker, of Ohio, at the Hollenden. The purpose of this convention is to call the pertinent attention of the country to the enormous drain upon its resources by the employment of foreign ships to carry its freight, its mails and its citizens abroad. This condition involves not alone the payment of enormous sums of money to foreign steamship companies, but the loss of scores of millions of dollars of trade in South America and Oriental markets, because direct lines of shipping are lacking. Further emphasis has latterly been given to this lamentable condition by the employment of foreign vessels to coal the American naval fleet in its journey from the Atlantic to the Pacific. This spectacle would really be ludicrous were it not serious. Think of an American battleship squadron crossing to the Pacific with British, Norwegian, Dutch and Italian flags flying from the stern of its colliers. Are not the American naval vessels cruising through the grace of foreign nations? The Merchant Marine League believes that the establishment of an adequate merchant marine should rank with a tariff as an American policy, and that such will be the case just as soon as the people come to understand and appreciate what an incalculable gain it will be to the whole country.

BATTLESHIP FLEET.

One cannot pick up a daily newspaper nowadays without reading the most glowing accounts of the battleship squadron which is about to leave the Atlantic coast for the Pacific ocean, its formidableness and superiority as a fighting fleet. The daily newspaper is the only source of information that the layman has. He reads of the great gun power of the ships and their amazing capacity of offense and defense and concludes, to use his own choice phrase, that the country has got together a fleet that can "lick creation." As a matter of fact these ships are about as formidable as painted ships upon a painted sea. If they were needed they could do nothing. They can reach the Pacific coast in time of peace because there are plenty of foreign vessels to be got to carry coal for them; but if the Pacific coast was actually menaced by a foreign foe, they could not get there at all, because coal is contraband of war. What an absurdity it is to spend $300,000,000 for naval vessels and then decline to appropriate $2,000,000 or $3,000,000 to provide colliers for the fleet. One is not complete without the other. If the profits alone from sea postage were devoted to the upbuilding of the American merchant marine, a fleet of vessels available as colliers would speedily be created. How much longer is this short-sighted policy to continue?

OCEAN MAIL SERVICE.

The MARINE REVIEW in its next issue will pay attention to the annual report of Secretary Straus of the department of commerce and labor. In sending out this report the newspapers overlooked a very important paragraph, which is as follows:

"I am prepared at this time to recommend a measure that shall insure us superior mail communications with the republic of South America, with Australia by way of our insular territories in the mid-Pacific, and with the Philippines by way of Japan and China. The special political and commercial reasons for the establishment of such lines of American steamships are so familiar to congress that a statement of them here would be superfluous. Such a measure involves no new principles and no departure from a system already justified by our own experience and that of other nations. The compensation provided by the ocean mail act of 1891 is inadequate to establish American steamship lines to the great republics of South America and to the Philippines, Australasia and Asia. An amendment to that act increasing the compensation for such services to a rate which would be effective is at the present time the most feasible means of promoting our merchant marine. In my judgment the rate of $4 a statute mile

outward bound now provided for 20-knot steamers should also be provided for steamships of 16 knots or over on the routes which I have indicated."

SAVING IN FREIGHT RATES.

There are several significant things in the annual report just published by Maj. Graham D. Fitch, government engineer at Duluth, but one of the most significant is the following:

"From a comparison between the cost of improvements and the volume of commerce it may be stated here that the total amount of money expended by the government on the improvement of this harbor from the commencement of work in 1867 up to 1906, inclusive, was $5,021,597.92. The vessel freight received and shipped at this port during the same period was 207,395,267 tons and its market value was $2,593,135,606. From this it appears that the cost of government improvements has been less than one-fifth of one per cent of the value of the freight transported."

Major Fitch says it may not be possible to give exact figures showing the effect of the improvements of this harbor on freight rates, but the following statements have a bearing on the question:

"The average rate on freight passing through St. Mary's Falls canal in 1906 was 0.84 mills per mile per ton, and the average haul was 842.4 miles, as shown by the official records. If the same freight had been carried by rail the rate would probably have been as much as 3 mills per ton mile, making a difference of 2.16 mills per ton mile. Assuming this difference to apply to freight for Duluth-Superior harbor and that the average haul is 842.4 miles, the saving in cost of transportation by water would be $1.79 per ton, and for the 29,171,221 tons received and shipped at this harbor in 1906 the saving in cost amounts to $52,000,000 in that one year."

ORE SHIPMENTS.

The season of navigation for 1907 is at an end, though a few belated carriers are yet to reach port. The few vessels operating under excess insurance are having a hard time of it, owing to fog and heavy weather, five of them grounding in St. Mary's river. No season on the lakes has closed more quietly than the present one, there being no fluctuation whatever in the ore rate and very little in the coal rate. In fact, lake rates are becoming quite as steady as rail rates.

Notwithstanding that the ore movement was 3,775,160 tons heavier than it has ever been, it put no strain upon existing equipment. It has been handled with ease. The ore movement for the season of 1907 was 41,288,755 tons against 37,513,595 tons for 1906, a gain of 10 per cent. Following are the shipments by ports:

Port—	Dec., 1906.	Per cent of total.	Dec., 1907.	Per cent of total.
Escanaba	134,778	24.93	39,572	43.57
Marquette	47,814	8.65	4,466	4.92
Ashland	54,551	10.09	14,396	15.85
Superior	103,679	19.18	13,204	14.54
Duluth	122,043	22.57	.....	.....
Two Harbors	77,729	14.38	19,179	21.12
Total	540,594	100.00	90,817	100.00

Port—	Season 1906.	Per cent of total.	Season 1907.	Per cent of total.
Escanaba	5,851,050	15.60	5,761,988	13.95
Marquette	2,791,033	7.44	3,013,826	7.31
Ashland	3,388,112	9.03	3,437,672	8.32
Superior	6,083,057	16.22	7,440,386	18.02
Duluth	11,220,218	29.91	13,445,977	32.57
Two Harbors	8,180,125	21.80	8,188,906	19.83
Total	37,513,595	100.00	41,288,755	100.00

The movement for November, this year and last, is as follows:

Port.	Nov., 1906.	Per cent of total.	Nov., 1907.	Per cent of total.
Escanaba	748,912	20.06	469,373	11.29
Marquette	233,933	6.27	307,547	7.40
Ashland	284,500	7.61	319,438	7.69
Superior	626,633	16.78	679,237	16.34
Duluth	1,142,959	30.61	1,537,438	36.99
Two Harbors	697,223	18.67	843,043	20.29
Total	3,734,167	100.00	4,156,076	100.00

	To Dec. 1, 1906.	Percent of total.	To Dec. 1, 1907.	Percent of total.
Escanaba	5,716,272	15.46	5,722,416	13.89
Marquette	2,743,219	7.42	3,009,360	7.30
Ashland	3,333,561	9.02	3,423,277	9.31
Superior	5,979,378	16.17	7,427,182	18.03
Duluth	11,098,175	30.02	13,445,977	32.64
Two Harbors	8,102,397	21.91	8,169,727	19.83
Total	36,973,002	100.00	41,197,939	100.00

PIG IRON SITUATION.

Though sentiment is better and there is a general eagerness to resume activity as soon as financial conditions warrant it, little improvement is manifested in the iron and steel market. Pig iron is lower, quotations for northern and southern iron now being $17 valley and $14 Birmingham, respectively. At a meeting of blast furnace operators, located east of the Allegheny mountains and making foundry and malleable pig iron, held in Cleveland last week, the situation was generally discussed, and there was a hopeful view upon all sides. The demand for wire goods has increased. Cast iron pipe has declined $1 per ton. It is expected that the new rail specifications for 1908 will shortly be announced, and this step is counted upon as stimulating the rail market.

CADET ENGINEERS—REVENUE CUTTER SERVICE.

An exceptional opportunity is now offered bright young engineers to enter the government service as commissioned officers and secure a life position, with all the advantages of longevity pay, retirement for age or physical disability incurred in the line of duty, etc., as now obtain in the United States army and navy.

The United States revenue cutter service will hold an examination for the selection of candidates for appointment as cadet engineer to fill existing vacancies in that service, beginning Dec. 16, and covering a period of five days. This examination is open to all young men between the ages of 21 and 25½ years who have had the necessary engineering training, either at some technical school or in actual work, and who produce satisfactory testimonials of experience and good character.

The successful candidates will be appointed cadet engineers, and then probably will be assigned to the United States revenue cutter Itasca, which vessel is the practice-ship for cadets. During the term of service on the school-ship the cadet engineer is paid at the rate of $75 per month and an allowance of 30 cents per diem for commuted rations.

After serving not less than six months on this vessel, if he is found to be proficient in his duties, with the proper conduct and bearing of an officer, the cadet engineer is commissioned a second assistant engineer in the regular line of promotion; his salary is increased to $1,400 per annum, and he is assigned to duty on some one of the large cruising cutters stationed at the various ports of the United States.

Any person desiring full information relative to this examination should address the honorable secretary of the treasury, Washington, D. C., stating his full name, age and experience, upon receipt of which request a pamphlet will be forwarded setting forth the proper manner of making application for examination, and other regulations governing the admission of candidates.

M. Schirashi, general manager of the Toyo-Kisen-Kaisha, is at present in San Francisco. He brought with him to this country R. Asano, son of the president of the Toyo-Kisen-Kaisha, who has just graduated from the Japanese schools and will enter one of the American universities. The three 13,000-ton triple-screw turbine steamers building in Japan for this company will enter service next year. These are the most ambitious merchant craft ever constructed in Japan.

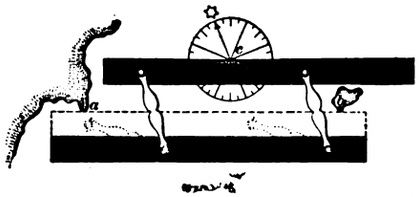
The revenue cutter Tuscarora was laid up Tuesday of this week at Milwaukee.

ANSWERS TO QUESTIONS FOR WHEELSMEN AND WATCHMEN.

TWENTY-THIRD INSTALLMENT. PUBLISHED NOV. 21.

258. East on the starboard side; NW on the port side.

259. Lay the beveled-edge of parallel rulers between the points to be sailed, and keeping the ruler in this position slide it forward to the nearest compass rose on the chart till the same edge cuts the center of the compass chart when read off the course, looking toward the direction to be sailed in. A parallel ru'er is so constructed that the rulers may be spread apart or pushed together and still remain parallel to each other. They are used for the purpose of transferring the direction of a bearing or course to the nearest chart compass diagram or compass rose. The following diagram will explain its use:



260. With the parallel rulers and chart compass.

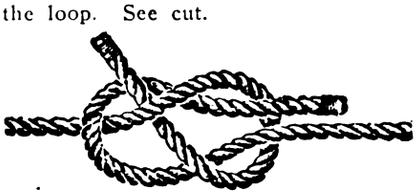
261. The course measured from the true meridian.

262. A true north and south line, or the great circles passing through the true poles of the earth; called meridians of longitude.

263. The part on the sheaves.

264. Oil well that portion.

265. Pass the end of one rope through the bight formed by another, then round the two parts of this second part, and bring it back through the loop. See cut.



266. Pass the end of one part round the end part of the other, then bring the two ends back toward their standing parts, passing one part round the other again, so that the two parts of each end reeve through the bight the same way. See cut. A reef knot is often called a square knot. The reef knot is one of the handiest knots in use. It will not bind.

267. The difference between the true meridian and the magnetic meridian of a place; or the difference between true north and magnetic north.

268. On the chart.

269. To allow for it beforehand, easterly to the left and westerly to the right. If the course has been steered and to find the actual course steered just the opposite way of the above is the rule.

270. Eight degrees easterly.

271. By looking in the lighthouse book furnished by the government.

272. Look it up in the government lighthouse book.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.

TWENTY-FIFTH INSTALLMENT.

285. How would you go at it to study for your first papers?

286. What are some of the first things necessary to know?

287. What is the test for color-blindness?

288. How could you tell whether or not you were color blind before going before the examiner?

289. What is an a'arm signal?

299. How many years' experience must you have before you are eligible for a second-class license?

300. What is deviation?

301. What is the meaning of Rule XI of the Pilot Rules for the year 1907?

302. What is the meaning of the Sixth Situation of the new diagrams?

303. When is a vessel under way?

304. What is leeway?

305. How would you find the leeway?

306. How would you allow for leeway?

QUESTIONS FOR MASTERS AND MATES.—NO. 51.

678. How would you proceed to get the middle fore-and-aft line on your boat?

679. How would you carry this line into the pilot-house?

680. How would you carry it on top of the pilot-house?

681. On a steel boat what can you depend on for a fore-and-aft line?

682. The compass shows a difference between light and with the tanks full of water. Is it the water in the tanks that is responsible for this difference?

683. Why is the true time irregular and that a watch cannot be constructed to keep time according to the actual movement of the sun?

684. What is the earth's orbit?

685. What is the sun's path called?

686. What is meant by the earth's inclination?

687. Why is the day and night always equal on the equator?

688. Why is it unequal at other places on the earth?

REPORT OF CHIEF OF BUREAU OF YARDS AND DOCKS.

Civil Engineer Richard C. Hollyday, United States navy, chief of the bureau of yards and docks of the navy department, whose estimates for the fiscal year ending June 30, 1909, were made public last week, plainly states in his annual report that without increased funds for the maintenance of navy yards and stations for the next fiscal year the bureau will be unable to conduct its part of the operations at all the yards. In taking over additional power plants during the coming fiscal year the expenditure under this head must be largely increased. The fund available for the present fiscal year is so small that the bureau is unable to answer the most urgent appeals from the yards for funds that should be expended under this appropriation in the interests of economy.

One special item included in the estimates is for 100-ton floating derricks to cost $1,015,000, for which an appropriation of $500,000 is recommended. At the present time the facilities for handling heavy weights at the navy yards are very meager. Many of the yards have 40-ton traveling cranes about the dry docks, and in some cases these cranes have their track so arranged that weights can be handled along the water front in some places; but for the purpose of handling the largest guns, turrets, boilers, or any ship appliances weighing more than 40 tons there is only one navy yard with the proper equipment. The New York navy yard has a 100-ton floating derrick of a special type which is very satisfactory. The Norfolk navy yard is equipped with a floating derrick of a nominal capacity similar to that of the New York yard, but there is no other navy yard on the Atlantic or Pacific coast with equipment of any character satisfactory for the purpose. The same condition exists in the Philippine Islands; in fact, there is no crane in the Philippines even nearly approaching the 40-ton capacity traveling cranes of the home stations. It is proposed to purchase four floating derricks similar in type to that at the New York navy yard, capable of handling a weight of 100 gross tons and equipped with an auxiliary hoist of much smaller capacity but of quicker action. The estimated cost of

one of these cranes complete at a home station is $250,000.

The consolidation of navy yard power plants, together with the material increase in the amount of electrical power consumed, necessitates the employment of a well-trained and experienced electrician to superintend this branch of the work, under the civil engineer. A competent man must be experienced, not only in electrical machinery, but in steam boilers and engines, air compressors, and the various distributing systems.

In refutation of a general impression that navy yards are extravagantly operated, the chief of bureau points out that as a matter of fact the expenditures for operation and upkeep are much less than for the best industrial and railroad corporations. The data show that industrial concerns expend an average of six per cent of the total valuation, disregarding depreciation, for the operation of their plants. Railroads in 1904 expended 3.95 per cent of total capitalization, or 4.59 per cent of total valuation, on maintenance and repairs. In 1905 the expenditure was 4.09 per cent of the total capitalization and 4.4 per cent in 1906. In 1906 the naval expenditures under "Maintenance" and "Repairs and preservation" were 1.1 per cent of valuation.

In ten years the work required of the bureau has doubled, while the money appropriated has been increased only slightly. With double the number of stations, twice the value in property owned, with the good and sufficient reasons given, it must be apparent that a large increase in appropriations is absolutely essential to the prosecution of the work in accordance with enacted law.

$69,270,000 FOR NAVY.

In his annual report to the president, which was made public recently, Secretary of the Navy Metcalf recommends that congress at its coming session appropriate $69,270,000 for the construction of new ships. This is the largest apportionment ever asked for by any secretary of the navy, for naval increases at one time, and is about two-thirds of the total annual appropriation for the entire naval establishment, including construction in the last few years.

Secretary Metcalf's recommendation is based on the reports of the general board of the navy and the board of construction. The general board first took up the subject of naval increase and made a recommendation for an increase amounting to $62,000,000. This report then was passed upon by the board of construction, which raised the limit of cost on many of the vessels, the increase aggregating $7,270,000. The recommendation is for the following ships:

No. and Class.	Unit Cost.	Total Cost.
4 battleships of the Delaware type....	$9,500,000	$38,000,000
4 scout cruisers of the Chester type.....	2,500,000	10,000,000
10 destroyers same type as those recently contracted for....	850,000	8,500,000
4 submarines of the Octopus type.....	380,000	1,520,000
1 ammunition ship....	1,750,000	1,750,000
1 repair ship	2,000,000	2,000,000
2 mine-laying ships conversion and equipment of two cruisers now on the list	250,000	500,000
4 fleet colliers.....	1,750,000	7,000,000
Total		$69,270,000

In commenting upon the building program, Secretary Metcalf says it is true that our navy at the present time is the second in efficiency, but he declares that this position cannot long be maintained unless congress shall authorize additional ships. He points out that our position is largely due to the fact that our sea fighting strength has been increased by the completion and delivery of several new battleships and cruisers of the largest and most approved type, and he adds that it is of the highest importance that the old and obsolete ships should be replaced by modern vessels. He gives his approval to the "all big gunship" of the Delaware type. The four ships recommended in his report are like the Delaware.

Mr. Metcalf shows that while the American navy is strong in battleships, there are three places where it is weak, and where other great naval powers are outstripping the United States in the matter of construction. These defects are found in the insufficient number of destroyers, submarines and colliers.

In regard to the colliers, he declares that the navy is woefully deficient. To meet these deficiencies he recommends the construction of 10 destroyers, 4 submarines of the Octopus type, the same as recommended as the result of the competitive tests, and 4 fleet colliers.

If these colliers were authorized to be built at government yards on the Atlantic coast, their construction would give permanent employment, he says, to a large force of efficient men. It is understood that this recommendation is made to provide work for the navy yards while the Atlantic fleet is on its long cruise to the Pacific.

Secretary Metcalf says there is no reason why we should not build big ships as quickly as other nations, and points to the rapidity with which the Japanese Ibuki and the English Dreadnought were turned out. He includes in his report also a brief summary of the naval building program of the different powers, commenting upon the absence of armored cruisers in these programs, and no vessels of this type are recommended in his report, the reason being that the latest type of armored cruiser has practically merged into the battleship, so that the distinction has almost disappeared. Mr. Metcalf shows that England is building three new Dreadnoughts, five destroyers, 12 torpedo boats and 12 submarines. France is building a large number of destroyers and submarines. Germany is building battleships, destroyers and submarines, as are also Japan, Russia, Italy and Austria.

LAUNCHING THE JACOB T. KOPP.

The bulk freighter Jacob T. Kopp, building for the Pennsylvania Steamship Co., was launched at the Ecorse yard of the Great Lakes Engineering Works on Saturday last and was christened by Mrs. Kopp. The Kopp is a duplicate of the steamer Boland and is therefore 500 ft. over all, 480 ft. keel, 54 ft. beam and 30 ft. deep. She will have 14 hatches, spaced 24 ft. centers. Her engines will be triple-expansion with cylinders 22½, 36 and 60 in. diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 13 ft. 9 in. by 11 ft. 6 in. She will carry 8,000 gross tons.

Consul-General George H. Anderson, stationed at Rio Janeiro, has informed the department of commerce and labor that a new line of steamships running between New York and Brazilian and other ports on the east coast of South America is about to be established to be maintained as long as business warrants. The sailings will be made every two weeks.

The torpedo boat Shubrick was in collision with the New York, Philadelphia & Norfolk line steamer Maryland in Hampton Roads, Nov. 22, and was quite seriously damaged. She has been taken to the navy yard at Washington for dry docking and a board of inquiry has been appointed to fix the responsibility for the collision. The Shubrick is not of the torpedo flotilla ordered to the Pacific.

The members of the house committee on appropriations, headed by Congressman James A. Tawney, of Minnesota, who went to Panama recently to inspect the work being done there, have returned. While everything is reported as progressing in a satisfactory manner it is believed that the result of the trip will be to reduce the desired $32,000,000 appropriation by $1,000,000.

ATLANTIC COAST GOSSIP

Office of THE IRON TRADE REVIEW,
1005 West Street Bldg.,
New York City.

According to the *Cologne Gazette* there is a prospect of a settlement of several matters over which the North German Lloyd and Hamburg-American lines have been at odds, this being the outcome of a conference between representatives of shipping interests.

Arrangements will probably be made regarding the apportionment of steerage business, and prominent officials of each company regard the renewal of the pool as assured. It is said, also, that negotiations are proceeding between the German and English companies looking to an agreement concerning the classification of cabins, and that the prospects of a settlement are favorable.

The old barge Expounder, which during the civil war was one of the powerful vessels of the United States navy, was destroyed by dynamite on Nov. 29. For some time the Expounder had lain imbedded in the mud at Field's Point, Narragansett Bay, and her destruction was ordered by officials of the government.

Paul F. Gerard & Co., who have been acting as outward freight agents of the Prince line of steamers to Brazil and the River Plate for the past year, have been appointed general agents of the line, to take effect Jan. 1.

The Mediterranean service of the Prince line will continue in charge of C. B. Richard & Co.

Mr. E. L. Boas, resident director and general manager of the Hamburg-American line, announces the appointment of Louis M. Weickum to take full charge of all matter pertaining to advertising and publicity.

By direction of the president the revenue cutters Woodbury, Gresham, Dexter, Mohawk, Onondaga, Apache and Seminole have been designated to cruise on the Atlantic coast from Eastport, Me., to Savannah, Ga., including Chesapeake Bay, to aid vessels in distress. The cruising season will begin Jan. 1 and end April 1, 1908.

Receiver Hollis R. Bailey, of the Enterprise Transportation Co., of Worcester, was given authority by Judge Lowell in the United States court at Boston to sell the steamer Kennebec to the United States Transportation Co. of Connecticut for $125,000.

The Kennebec was purchased from the Eastern Steamship Co. a year ago, and is a side-wheel steamer of 1,260 tons burden.

Capt. Benjamin F. Marsh, an ex-vice president of the New York Marine Society and commander of several of the noted clipper ships that sailed from this port in the early fifties, died in Miami, Fla., on Nov. 28, aged 86 years.

Captain Marsh was well known among shipping men around New York, and was considered one of the best navigators of his day. It is said that he took ships across from this port to Havre in the old packet days in less than three weeks. After retiring from the sea Captain Marsh became associated with the firm of Lothrop & Marsh, produce commission merchants, retiring from this business several years ago. His death resulted from a heavy cold and the effect of two falls which he recently suffered.

The Newport News Ship Building Co. has laid the keels for two tugs for the Lackawanna railroad.

It is reported that the Umbria and Etruria of the Cunard line have been sold to the Canadian Pacific railway.

Crowell & Thurlow, of Boston, have closed a contract with Cobb, Butler & Co., of Portland, Me., for a four-masted schooner for the lumber trade. The vessel is to be 175 ft. in length, 23 ft. beam, and 14 ft. depth of hold.

Trans-Atlantic liners which arrived at New York in the early part of the week reported encountering exceptionally heavy weather in midocean. The vessels themselves, in several cases, bore evidence of the violence of the seas in the shape of damaged deck gear and fittings. They were all more or less overdue on this account, the Lusitania, which came in for a goodly share of the buffeting, averaging only 19.52 knots for the entire passage.

The methods of the latest type of trans-Atlantic swindler are worthy of attention. A second cabin passenger on one of the large German steamers persuaded a number of his alien fellow-voyagers that he could secure their entry to the United States, by payment of a small fee, without the necessity of going through Ellis Island. Cards, purporting to be signed by the master of the vessel, were sold for prices ranging from $1 to $5, the buyer having the privilege aforementioned.

Needless to say the man was arrested and turned over to the proper authorities. The passengers had their money returned.

Captain A. Ohls, of the Lamport & Holt steamer Tennyson, died suddenly on Dec. 7 at the Hotel Netherland, New York. Capt. Ohls was one of the best known masters in the Brazilian trade, and had recently been notified by the company of their intention to place him in command of the new steamer Verdi.

The Clyde Line steamship Pawnee, while outward bound on the evening of Dec. 5 from Philadelphia to New York, collided with the three-masted schooner Harlan W. Hunston, also outward bound for Newport News, the latter vessel filling and sinking. She now lies 150 yards north of the ship channel, and is considered a menace to navigation.

The Harlan A. Huston hails from Bethel, Del., and was valued with her cargo at $10,000. The captain and crew, after making every effort to beach the damaged vessel, took to the boats and were picked up by the Pawnee.

The Austro-American Steamship Co., Ltd., are equipping the five of their best steamers in the passenger trade with the Marconi wireless system. Advices to that effect were recently forwarded from the home office at Trieste, and the first of the steamers to have the system installed, the Laura, has arrived at New York. The other steamers to be equipped are the Alice, Martha Washington, Argentina and Oceania.

The North German Lloyd Line on Saturday announced a reduction in the steerage rate from this port to Bremen. On the express steamers Kronprinzessin Cecilie, Kronprinz Wilhelm, and Kaiser Wilhelm der Grosse, the rate is reduced from $42 to $38. The steerage rate on the other steamers stays at $34.

The Cunard liner Mauretania passed Daunt's Rock at 5:49 p. m. on Dec. 5, beating the best time of the

Lusitania by 21 minutes. Her time for the entire distance of 2,807 miles was 4 days, 22 hours and 29 minutes, the days' runs being 548, 535, 556, 554, and from noon of the last day till passing Daunt's Rock, 124 miles. Her average speed for the voyage was 23.69 knots.

The schooner Rebecca Shephard, from St. George's, Staten Island, for Lynn, which got her anchor afoul of the buoy at Pollock Rip Slue and was unable to clear herself owing to the northeast storm, rolled over and sank on Dec. 6. The life-savers at Monomy landed the crew.

The Shepherd was a three-masted schooner, built at Milford, Del., in 1873.

Fishermen coming in from the west shore of Nova Scotia report at Halifax the passing of a tidal wave which reached its height at about the time when the steamer Mount Temple ran aground on La Havre Ironbound Island. They are of the opinion that the steamer was carried off her course by the tremendous tide. They report an extraordinary rise of water, causing considerable damage among beached boats and fishing tackle, several fishermen's wharfs also being destroyed.

The Cunard liner Carmania became wedged fast on a mud bank in the new Ambrose channel while leaving port Saturday for Europe, remaining in that position in spite of all efforts to float her till flood tide, when, with the assistance of a small fleet of tugboats, she slid into deep water. She returned to quarantine and was anchored to await developments, and refill her fresh water tanks, but it is not thought she sustained any serious damage.

Representative Sydney E. Mudd, of Maryland, member of the house naval committee, thinks the navy should have another large floating dock on the Atlantic coast, and will introduce a bill at this session of congress providing for the construction of same.

A cablegram was received at the office of the Red Star Line, New York, on Monday, stating that the Kroonland had broken one of her shafts during a heavy gale to the westward of the Lizard, and was proceeding to Liverpool. Later advices stated that she had altered her course for Southampton, where the necessary repairs will probably be made.

Capt. Parker, of the Morgan liner El Rio, brought word to New York of the abandonment at sea of the four-masted schooner Thomas A. Ward. Before leaving the Thomas A. Ward, Capt. Curtis and the crew of nine had set her afire, being themselves picked up later by the schooner Judge Pennewill. The Homas A. Ward sailed from Jacksonville, Fla., on Dec. 2, loaded with railroad ties for New York, but became water-logged and wrecked in a heavy storm. She was built at Camden, N. J., in 1891, and was owned by Benjamin Lyman, of Manasquan.

NOVEMBER LAKE LEVELS.

The United States Lake Survey of Detroit reports the stages of the Great Lakes for the month of November, as follows:

Lakes—	Feet above tide water New York.
Superior	602.87
Michigan-Huron	580.79
Erie	572.37
Ontario	246.26

In the intervening month Lake Superior has fallen nearly 4 in., Lakes Michigan and Huron nearly 5 in., Lake Erie 4 in., and Lake Ontario 1½ in. December stages should show a further lowering of upwards of 3 in. for Superior, Michigan and Huron, and over an inch for Erie and Ontario.

Lake Superior is 1½ in. higher than the average November stage of the past ten years, is 2½ in. higher than last year, and 6 in. higher than in 1895; but it is 3 in. lower than in 1904 and 1905, 7¾ in. lower than in 1900, and 5½ in. lower than in 1890.

Lakes Michigan and Huron are 3½ in. higher than the average November stage for the past ten years, 1 in. higher than last year, 19½ in. higher than in 1895, but ½ in. lower than in 1905, 2 in. lower than in 1890, and 25½ in. lower than in 1876.

Lake Erie is 7½ in. above the average November stage of the past ten years, 2½ in. higher than last year, 5 in. higher than in 1905, 3 in. higher than in 1904, and 20 in. higher than in 1895; but it is lower by 4½ in. than in 1890, and lower by 13½ in. than in 1876.

Lake Ontario is 13 in. above the average November stage of the past ten years, 5½ in. higher than last year, ½ in. higher than in 1905, and 34 in. higher than in 1895; but it is lower by nearly 4 in. than in 1890, and lower by nearly 5 in. than in 1876.

MARINE UNDERWRITERS AND SUBMARINE SIGNALS.

Capt. James B. Watt, master of the Cunard steamship Lusitania, clearly states the revolution wrought by submarine signals when he says in an official report, dated Nov. 11, 1907:

> Nearly all my sea life I have been looking forward to getting the assistance of a reliable sound signal. Now I feel that we have got it. All that is required, in my opinion, is its universal application.

Such is the opinion of one of the great steamship captains of these times, deliberately stated as the result of more than two years of experience with submarine signals, while he was master of the Lucania and of the Carmania.

Now that the various governments are providing for navigators these reliable fog signals, loss of life and property will be diminished in proportion to the number of stations sending submarine signals, and the number of ships equipped to receive such signals.

Obviously it is of the highest importance to marine underwriters to know what ships are receiving submarine signals, so that they can justly estimate the risk on the vessel and on the cargo. For the convenience of marine underwriters the American Bureau of Shipping will note the fact of such equipment, in the 1908 edition of *The Record of American and Foreign Shipping*. In connection with the name of each vessel having the submarine signal receiving apparatus, the abbreviation "SUB. SIG." will be printed. Also the bureau will keep on file for the information of members, subscribers and correspondents full information in regard to additional vessels and stations equipped; so that underwriters and others can always keep themselves informed as to the advances in the safety of navigation made by the extension of submarine signaling.

The action taken by the American Bureau of shipping is the first of a series of movements now well started among marine underwriters to give their powerful aid to the extension of a system of fog signals which they recognize as an efficient means of preventing losses at sea.

Free dockage will be furnished boats at Bay View Park, Toledo. The council of Toledo recently voted enough money to put in necessary piling to make secure fastenings for the boats. There is room in the lagoon at Bay View Park for 25 or 30 boats, and there is no danger whatever from high water or running ice.

ACCIDENTS OF A MONTH

Accidents to lake vessels during the past month have been few in comparison with the usual number which occur during November, each year. Five vessels were totally lost, four having been destroyed by fire. The steamer Lizzie Madden, which burned on Saginaw Bay, and the steamer City of Glasgow, which burned on Green Bay, might be considered as the heaviest losses.

The car ferry Pere Marquette No. 16, which was badly damaged in a storm on Lake Michigan, was the most disastrous accident resulting from weather conditions, her repairs involving an estimated expenditure of $35,000.

Three lives were lost on Lake Ontario through the sinking of the tug Escort. Groundings were more numerous than any other cause. Five collisions occurred, none of which, however, resulted in great damage.

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	PLACE.
Nov. 10	Str. Flagg	Ran on east bank during snow storm; released following day, uninjured	Bar Point, Detroit river.
Nov. 10	Str. Wyoming	Ran aground; released after lightering 300 tons; lost wheel, docked for repairs	Portage Lake ship canal.
Nov. 10	Str. James E. Davidson	Grounded; released, uninjured	Bar Point, Detroit river.
Nov. 11	Str. A. B. Wolvin	Hit abutment of Superior Ave. viaduct; stern damaged	Cleveland.
Nov. —	Str. V. Swain (old)	Burned in big fire along water front; not in commission when accident occurred	Superior harbor.
Nov. 13	Str. Frank Peavey	Driven ashore in storm; released on Nov. 14; slightly injured	Buffalo.
Nov. 13	Str. Neepawah	Rammed gates of Lock No. 1, carrying them away; steamer slightly injured	Lachine canal.
Nov. 13	Bge. Regina	In tow of steamer Neepawah when she crashed into gates of canal; carried into outer harbor and sank; both vessel and cargo of 25,000 bu. of wheat total loss	Lachine canal.
Nov. 13	Str. Ramapo	Lost rudder; towed to Sheboygan; loss, $2,500	Lake Michigan.
Nov. 13	Str. Selwyn Eddy	Three buckets broke off her wheel	
Nov. 14	Str. L. S. DeGraef	Ran aground; released on Nov. 15 after lightering considerable of her cargo	Bar Point, Detroit river.
Nov. 14	Bge. Baltic	Broke away from steamer which towed her; broke rudder	Harbor Beach, Mich.
Nov. 14	Str. D. R. Hanna	Backed into dock while loading coal; disabled her rudder; repaired before leaving port	Huron, O.
Nov. 14	Bge. Chieftain	Ran aground; released on Nov. 15; towed away	Portage river.
Nov. 16	Str. Fayette Brown	Ran aground; stem damaged	Buffalo harbor.
Nov. 17	Str. Orinoco	Broke her steering gear; towed to Duluth	Lake Superior.
Nov. 17	Bge. Chieftain	Broke away from steamer while being towed away in disabled condition; picked up by passing steamer	Lake Superior.
Nov. 19	Str. W. L. Brown	Ran aground; released on Nov. 23	Detroit river.
Nov. 20	Str. Northern Queen	Broke piston rod in reverse engine; stopped for repairs	Sault canal.
Nov. 20	Str. Kearsarge	Engine disabled; stopped for repairs	Near Glen Haven, Mich.
Nov. 20	Str. Lackawanna	Broke air pump; delayed several hours	Detroit river.
Nov. 20	Bge. G. K. Jackson	Driven ashore in storm; crew rescued; not damaged	Lake Huron.
Nov. 21	Str. Western Star	Ran aground; released on Nov. 22; bottom damaged; several plates taken off; docked for repairs	Buffalo breakwater.
Nov. 21	Str. Wyoming	Broke away from steamer which towed her down in disabled condition	St. Clair river.
Nov. 21	Car ferry Pere Marquette No. 16.	Badly damaged in storm; stanchions broken, steampipes and smokestacks badly bent; deck broken through; docked for repairs at Chicago; damage estimated at $35,000	Lake Michigan.
Nov. 21	Schr. Bertha Barnes	Struck bridge, damaging it somewhat; head gear of steamer carried away; left Sturgeon Bay on Nov. 26	Sturgeon Bay, Wis.
Nov. 21	Str. W. D. Rees	Steering gear became disabled	Saginaw Bay.
Nov. 22	Str. W. L. Smith	Ran into steamer A. E. Ames	Cleveland harbor.
Nov. 22	Str. A. E. Ames	Rammed by steamer W. L. Smith; two stern plates cracked	Cleveland harbor.
Nov. 23	Str. Lizzie Madden	Burned; later washed ashore at Little Charity Island; machinery to be recovered; otherwise total loss	Saginaw Bay.
Nov. 23	Tug Escort	Turned turtle; three lives lost	Near Port Dalhousie, Lake Ontario.
Nov. 23	Str. Mars	Sheered and ran into barge Ludington which was anchored; not injured	Detroit river.
Nov. 23	Bge. Ludington	Crushed by steamer Mars which ran into her; deck raised; leaked badly; docked at Ecorse	Detroit river.
Nov. 24	Str. Monohansett	Burned; total loss	Lake Huron, off Thunder Bay Island.
Nov. 25	Str. John B. Trevor	Ran on rocks in heavy fog; released on Nov. 27, uninjured	Detroit river.
Nov. 27	Str. Aurania	Grounded; released in four hours, uninjured	Chicago river.
Nov. 28	Schr. Dresden	Ran ashore; abandoned as total loss; machinery will probably be saved	N. Manitou Island, Lake Michigan.
Nov. 29	Str. Tacoma	Ran aground; released, uninjured	Round Island, Straits of Mackinaw.
Nov. 29	Str. City of Glasgow	Ran aground in snow flurry; released, uninjured	Peshtigo reef, Green Bay.
Nov. 29	Str. E. F. Holmes	Stranded owing to low water; released, uninjured	Detroit river.
Nov. 30	Str. Socapa	Ran aground; released after lightering 500 tons	Breakwater shoal, Buffalo.
Dec. 1	Str. Morrow	Stranded; released on Dec. 2, uninjured	Bar Point, Detroit river.
Dec. 2	Str. Empire City	Stranded in thick weather; released, uninjured	Indiana Harbor, Lake Michigan.
Dec. 2	Str. Scranton	Struck against pierhead; broke wheel and quadrant	Ashtabula harbor.
Dec. 3	Str. City of Glasgow	Burned; crew rescued; total loss	Green Bay.
Dec. 4	Str. Joliet	Disabled	Southeast shoal, Lake Erie.
Dec. 5	Str. E. D. Carter	Steering gear disabled; slightly injured	Detroit river.
Dec. 5	Str. Fayette Brown	Steering gear disabled and rudder tackle broken while out in heavy weather; temporary steering gear installed and she went to Marquette to be repaired	Keweenaw Point, Lake Superior.
Dec. —	Str. Sam Mitchell	Rammed by steamer Manistee; docked for repairs	Milwaukee.
Dec. 5	Sand sucker Mary	Collided with steamer McKerchey; bulwarks on starboard side stove in and spar down; damage estimated at $1,200	Detroit river.
Dec. 5	Str. McKerchey	Collided with sand sucker Mary; not damaged	Detroit river.
Dec. 7	Str. Desmond	Collided with wrecked steamer Reis which stranded while being towed down	St. Clair ship canal.
Dec. 7	Str. C. W. Elphicke	Stranded; released on Dec. 8, uninjured	Lake Michigan.

SHIP YARD NOTES.

The Union Iron Works Co., San Francisco, Cal., is repairing the steamer Aztec.

Patrick McLaughlin, Riverside, Cumberland county, Nova Scotia, is about to begin the work of constructing a 200-ton schooner.

Dempsey & Sons, Philadelphia, Pa., have launched a steel barge for trade between Philadelphia and North Carolina ports.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., will soon lay the keel for the 20,000-ton battleship Delaware.

The Risdon Iron Works, San Francisco, Cal., has recently effected repairs to the amount of $60,000 to the Pacific Mail Co.'s steamer Indiana.

The Skinner Ship Building & Dry Dock Co., Baltimore, Md., recently launched a large wooden water and coal barge for the Standard Dredging Co.

The steamer Indravelli, which was ashore some time ago, will be repaired at the Bullen ship yards at Esquimalt, B. C., for the sum of $40,000.

Charles L. Rohde & Sons, Baltimore, Md., have launched an open lighter for M. W. Adams & Co., which is 85 ft. long, 26 ft. beam and 7½ ft. deep.

The Moore & Scott Iron Works, San Francisco, Cal., were awarded the contract for effecting repairs to the Pacific Coast Steamship Co.'s steamer Pomona, their bid being for $5,395.

The Kerr-Lloyd Iron Works, San Francisco, Cal., were the successful bidders for repairing the engines, boiler and hull of the army transport Thomas, their bid being for $1,570.

Gardiner G. Deering, Bath, Me., will have the four-masted schooner now building at his yard ready for launching before the first of the year. The vessel has not as yet been named.

The Skinner Ship Building & Dry Dock Co., Baltimore, Md., has launched a combination derrick and coal lighter for the Standard Oil Co., which will be sent to Porto Rico. It is 100 ft. long, 30 ft. beam and 8 ft. deep.

Charles L. Rohde & Sons, Baltimore, Md., have laid the frame for a covered lighter which they will build to the order of the Atlantic Transport Co. which will be 90 ft. long, 28 ft. wide and 7½ ft. deep.

J. Lindstrom, Aberdeen, Wash, recently repaired the steam dredger Pacific, owned by the North American Dredging Co. This dredger is the largest of her class in the world and was built at Tacoma in 1903.

The Bertelsen & Petersen Engineering Co., East Boston, Mass., has been awarded contracts for repairing the lighthouse tenders Lilac and Mayflower, the former for the sum of $13,750 and on the latter to the amount of $2,291.

The Skinner Ship Building & Dry Dock Co., Baltimore, Md., recently launched the last of the four tugs which it has built for the Standard Oil Co., known as No. 19. Nos. 16 and 17 are already in service and No. 18 is ready for delivery.

E. W. Heath, Tacoma, Wash., has been awarded contract for the construction of a whaling steamer to be ready for launching March 1. She will be 100 ft. long, 19 ft. beam and 11 ft. molded depth, motive power to be furnished by triple-expansion engines.

The Moran Co., Seattle, Wash., was the successful bidder for repairing the Pacific Coast Steamship Co.'s steamer Cottage City, which broke her tailshaft on the trip down from Alaska and had to be towed to port. Other repairs will be effected while at the plant. The contract is for $4,688.

A new vessel will be built for the Bothell Transportation Co., Seattle, Wash., which operates steamers on Lake Washington, which will be 75 ft. long, 14 ft. beam and 4 ft. draught. She will be built by La Point and is expected to develop a speed of 18½ knots with 180-H. P. engines.

The Fore River Ship Building Co., Quincy, Mass., will lay the keel for the battleship North Dakota on Dec. 16. Owing to the fact that this vessel is to be larger than any heretofore constructed by this company it has been necessary to increase the foundations to the building ways, which has been done by the use of concrete.

The Commercial Street Boiler Works, Seattle, Wash., was the successful bidder for the repair work on the Pacific Coast Steamship Co.'s steamer Tampico, the contract being awarded to the company for $23,344, the work to be performed within 30 days. The Tampico was damaged by striking a reef, owing to a gas buoy having shifted out of position.

The board of public works of the city of Seattle, Wash., recently authorized the firm of McAllaster & Bennett, marine architects of that city, to furnish plans and specifications for a fireboat, for the purpose of building which $50,000 was appropriated last year and $45,000 included in the tax levy for next year. It is estimated that the boat will cost $125,000 or more and will have a capacity of 10,000 gallons of water a minute.

Bids received at the office of the Isthmian canal commission on Dec. 2 for the construction of one knocked down stern wheel tow boat f. o. b. at works of contractors, were as follows: Maryland Steel Co., Sparrow's Point, Md., $44,500; Pusey & Jones Co., Wilmington, Del., $24,793; Charles Ward Engineering Works, Charlestown, W. Va., $27,500; James Rees & Sons, Pittsburg, Pa. (delivery at New York), $32,500.

PERSONAL.

John C. McMynn has resigned his connection with Robert W. Hunt & Co., taking effect Dec. 1.

Mr. D. O'Connell has succeeded H. N. Bennett as manager of the marine department of the Bird-Archer Co., 90 West street, New York, and is assisted by J. R. Gatchel and E. J. DuBois.

Mr. R. O. Jones, for the past nine years chief engineer of the Jeansville Iron Works, Hazelton, Pa., has entered the employ of the Dayton Hydraulic Machinery Co., Dayton, O., as chief engineer. Mr. Jones is an engineer of wide experience in the manufacture and construction of pumps of all kinds.

William S. Love, who for the past eight years managed the business of the Wheeler Condenser & Engineering Co. in the central west, and who has been in New York for the last year as general sales manager, will resume charge of the Chicago office of the company at 1137-8 Monadnock building, on Jan. 1, 1908. Mr. Love's large circle of friends and acquaintances will be pleased to again receive his direct personal attention in this large and important territory.

W. H. S. Bateman, well known in the east and south among the users of iron and steel products, having been connected with the Lukens Iron & Steel Co., of Coatesville, Pa., for a number of years, and recently southern sales agent for the Chicago Pneumatic Tool Co., has assumed the position of general and southern sales agent for the Champion Rivet Co. of Cleveland, with headquarters at Philadelphia, Pa. Mr. Bateman will look after the interests of the Champion Victor rivets in eastern Pennsylvania, western New York, and the southern states.

The office of Major C. H. McKinstry, corps of engineers, San Francisco, has been moved from 1892 Golden Gate avenue to 665 Monadnock building, 681 Market street, San Francisco.

AROUND THE GREAT LAKES.

V. A. Siering, first mate of the steamer Matthew Andrews, is a prominent member of the Elks at Ashtabula. The Andrews has taken on a cargo of coal at Cleveland winter storage.

The steamer Samuel Mitchell, which was hit by the Manistee at Milwaukee last week, will be docked for repairs. Three plates were dented, one frame was broken and the fender streak was smashed.

A heavy fog which hung over the Sault last week delayed a number of big carriers coming down the lakes, some having to lay over for 60 hours. The fog started on Friday noon and did not clear away until Monday.

Capt. W. C. Richardson, well-known vessel owner of Cleveland, fell through a hole in the Lackawanna dock at Buffalo last Thursday, cutting a gash in his right leg. He was looking after the laying up of his boats.

The steamer John Crerar, which stranded at Whitefish point, Lake Superior, recently, is also in dry dock at Buffalo for extensive repairs. Her bottom was seriously damaged, and about 30 plates will have to be taken off her side.

The Canadian Pacific steamer Keewatin which was put together at Buffalo is in dry dock there for repairs to damages received on her way to the lakes from Scotland. About 18 plates will have to come off and other injuries will be remedied.

The steamer Leland S. DeGraef of the Weston Transit Co.'s fleet, arrived at Buffalo on Monday last with 421,000 bushels of wheat from Duluth. This is the largest cargo ever brought down the lakes, and breaks the record held by the steamer W. M. Mills of the same fleet, which on Nov. 27 brought down 416,000 bushels.

The tugs Reid and Ottawa of the Reid Wrecking Co., together with the steamer M. C. Neff, arrived at Portage entry on Dec. 7 with the wrecked steamer Spokane, which has just been released from Gull rock, Lake Superior, where she stranded some time ago. The Spokane was abandoned to the underwriters several weeks ago as a total loss.

The Erie canal was officially closed to navigation on Tuesday of this week. Owing to the break at Syracuse which delayed navigation for seven weeks, and which caused heavy losses to boatmen and shippers, the season's business had a great falling off. Grain rates were higher than they have been for the past 15 years and were advanced toward the close.

The steamer Wm. E. Reis, which was sunk in collision with the steamer Monroe C. Smith in the St. Clair river during November, and which was raised by wrecking master Harris W. Baker last week, ran aground in the Detroit river while being towed to the Zug Island furnace to unload her cargo of ore. The lighter Reliance was summoned and took off 2,000 tons of ore in order that she may unload the remainder of her cargo at the furnace. The steamer will probably be repaired at Detroit.

The hulk of the burned steamer City of Glasgow, which burned near Green Bay recently, and which blocks the entrance to that port, will probably be dynamited. There are several boats blockaded in the harbor and Major Judson has been asked to remove the obstruction at once. Capt. Sinclair, representative for the underwriters, after examining the steamer, stated that the hull is badly burned and that it will be difficult to recover the machinery, as it has fallen into the hold. She will therefore probably be blown up.

The car ferry Charles Lyon, building for the Canadian Pacific railway, was launched at the yards of the Polson Iron Works, Toronto, last Monday, and was christened by Mrs. J. B. Miller, wife of President Miller, of the Polson company. The steamer is 280 ft. long, 40 ft. molded breadth, 22 ft. molded depth, center, and draws 12 ft. on full load. The Lyon is designed to run between Prescott, Ont., and Ogdensburg, N. Y., and is expected to go into commission next April. The steamer will be operated all year round.

The steamer Illinois, owned by the Great Lakes Dredge & Dock Co., of Chicago, and one of the largest hydraulic dredges on the great lakes, sank in Lake Michigan last Monday while being towed from Chicago to South Chicago to go into winter quarters. The crew narrowly escaped drowning, but were rescued by the tug Harry C. Lydon. The Illinois set out in a heavy sea and was tossed about until her seams opened. She rapidly filled with water and went to the bottom. It is feared that the steamer will be entirely broken up before she can be raised, but an attempt will be made to recover her machinery. She was valued at $65,000.

The steamer Desmond, owned by the Detroit River Transit Co., Detroit, Mich., collided with the stranded steamer Reis in the Detroit river last Saturday and sank. The Desmond was coming down and tried to pass the stern of the Reis which was lying in the west channel when she struck her. The Desmond had a large hole stove in her, but managed to pass the Reis before she sank. The captain tried to beach her, but she was leaking too much and sank in 22 ft. of water before she could be run aground. Capt. H. W. Baker, who is to raise the steamer, expects to be able to do so within a week. The insurance on the Desmond lapsed with the expiration of the general insurance on Thursday.

President Eugene Zimmerman, of the Detroit, Toledo & Ironton railway, has announced that direct communication between Detroit and the Pomeroy coal district in Ohio will be provided. He stated that the company will immediately begin the construction of docks along the river front at Detroit, and in spring 25 miles of line will be constructed, reaching to these coal fields, which are said to be among the richest in Ohio. This being the only line connecting Detroit directly with the coal fields, it is expected that that port will become prominent as a shipping point. Ore coming from the great northern fields will be distributed along this line, where there are 19 furnaces, the consumption of which is more than 1,000,000 tons a year.

Senator Knute Nelson will introduce in congress a bill creating a new lighthouse district with Duluth as headquarters. At present there are 16 lighthouse districts in the United States, the Detroit and Chicago stations being the two nearest to Duluth. The new seventeenth district will become the most important of any of them. The eleventh district, which extends from Detroit to the west end of Lake Superior, and which therefore embraces Duluth and Lake Superior, includes all aids to navigation on American shores and waters of Lakes St. Clair, Huron and Superior, the upper part of the Detroit river, St. Clair and St. Mary's rivers, and that part of the Straits of Mackinaw lying to the eastward of the line drawn across the straits just to the eastward of old Mackinaw Point light station, Michigan. There are 243 lighthouses and beacon lights in the district, including 24 post lights, 3 light vessels in position, 1 day or unlighted beacon, 34 fog signals operated by steam, 6 fog signals operated by clock work, 38 gas lighted buoys in position, 2 bell buoys in position, and 386 other buoys in position, the steamers Marigold and Aspen, buoy tenders and for supply and inspection; the steamer Amaranth for construction and repair.

BIDS FOR NAVAL SUPPLIES.

Bids received at the Buroau of Supplies and Accounts, Navy Department, Washington, D. C., opened Nov. 26, for materials and supplies for the navy yards, included the following:

Class 21—Puget Sound—1,125 Sq. Yds. Sheet Packing.

American Rubber Mfg. Co., Emeryville, Cal.	$ 6,187.50
Boston Belting Co., 256 Devonshire St., Boston, Mass.	7,750.00
Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.	5,575.00
Diamond Rubber Co., 1876 Broadway, New York	5,089.50
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York	6,300.00
Frank Richter, 212 Jackson St., Seattle, Wash.	6,958.00
Voorhees Rubber Mfg. Co., 48 Dey St., New York	5,798.50
Richard H. Gray, 1777 Tenth Ave., East Oakland, O.	7,000.00

Class 22—Puget Sound—4,500 Lbs. Red Rubber Packing.

Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.	$ 2,250.00
Gorham Rubber Co., 301 First Ave., South Seattle, Wash.	2,430.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	2,475.00
Garlock Packing Co., 136 Liberty St., New York	2,385.00
Jenkins Bros., 71 John St., New York	2,565.00
H. W. Johns-Manville Co., 100 William St., New York.	2,655.00
Frank Richter, 212 Jackson St., Seattle, Wash.	2,115.00
William G. Stevenson, 110 Race St., Philadelphia, Pa.	2,475.00

Class 23—Puget Sound—Garlock Spiral Packing.

Garlock Packing Co., 136 Liberty St., New York	$ 4,615.06
Magnesia Asbestos Supply Co., 116 Main St., Seattle, Wash.	4,336.25

Class 58—Puget Sound—3,000 Ft. Upper Deck Hose.

Boston Belting Co., 256 Devonshire St., Boston, Mass.	$ 3,000.00
Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.	2,310.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	2,430.00
Manning, Maxwell & Moore, 85 Liberty St., New York.	2,565.00
Pacific Engineering Co., Seattle, Wash.	4,320.00
Frank Richter, 212 Jackson St., Seattle, Wash.	2,700.00

Class 59—Puget Sound—1,500 Ft. Wash Deck Hose.

Boston Belting Co., 256 Devonshire St., Boston, Mass.	$ 1,200.00
Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.	750.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	840.00
Manning, Maxwell & Moore, 85 Liberty St., New York.	850.50
Frank Richter, 212 Jackson St., Seattle, Wash.	900.00

Class 60—Puget Sound—2,000 Ft. Rubber Fire Hose.

Boston Belting Co., 256 Devonshire St., Boston, Mass.	$ 2,200.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	2,120.00
Pacific Engineering Co., Seattle, Wash.	2,880.00
Frank Richter, 212 Jackson St., Seattle, Wash.	2,400.00

Class 61—Puget Sound—1,000 Ft. Steam Hose.

Boston Belting Co., 256 Devonshire St., Boston, Mass.	$ 700.00
Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.	600.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	630.00
Frank Richter, 212 Jackson St., Seattle, Wash.	720.00
Sprague Electric Co., 527 W. Thirty-fourth St., New York.	$435.00 590.00

Class 62—Puget Sound—90 Ft. Suction Hose.

Boston Belting Co., 256 Devonshire St., Boston, Mass.	$ 382.50
Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.	270.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	280.80
Manning, Maxwell & Moore, 85 Liberty St., New York.	306.00
Pacific Engineering Co., Seattle, Wash.	324.00
Frank Richter, 212 Jackson St., Seattle, Wash.	283.50
William R. Thompson, 704 Lafayette Ave., Brooklyn, N. Y.	287.10

Class 63—Puget Sound—4,000 Ft. Unlined Fire Hose.

Boston Belting Co., 256 Devonshire St., Boston, Mass.	$ 1,400.00
Gorham Rubber Co., 301 First Ave., South Seattle, Wash.	1,140.00
S. F. Hayward & Co., 20 Warren St., New York	1,150.00
Motley, Green & Co., 66 Broad St., New York	1,190.00
Manning, Maxwell & Moore, 85 Liberty St., New York.	1,060.00
Pacific Engineering Co., Seattle, Wash.	5,760.00
Frank Richter, 212 Jackson St., Seattle, Wash.	1,120.00
William G. Stevenson, 110 Race St., Philadelphia, Pa.	1,080.00

Class 64—Puget Sound—4,000 Ft. Pneumatic Hose.

American Rubber Mfg. Co., Emeryville, Cal.	$ 1,050.00
Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.	800.00
Chicago Pneumatic Tool Co., 95 Liberty St., New York	980.00
Gorham Rubber Co., 301 First Ave., South Seattle, Wash.	1,480.00
R. Levick Sons & Co., 720 Chestnut St., Philadelphia, Pa.	1,480.00
Mineralized Rubber Mfg. Co., 18 Cliff St., New York.	1,520.00
Sprague Electric Co., 527 W. Thirty-fourth St., New York.	$985.00 1,033.32

Class 65—Puget Sound—875 Lbs. Flax Packing.

Gorham Rubber Co., 301 First Ave., South Seattle, Wash.	$ 175.00
Manning, Maxwell & Moore, 85 Liberty St., New York.	159.00
Frank Richter, 212 Jackson St., Seattle, Wash.	262.50
William R. Thompson, 704 Lafayette Ave., Brooklyn, N. Y.	160.42
Old Dominion Paper Co., 98 Commercial St., Norfolk, Va.	168.00

Class 66—Puget Sound—Sheet Rubber for Gaskets.

American Rubber Mfg. Co., Emeryville, Cal.	$19,376.87
Boston Belting Co., 256 Devonshire St., Boston, Mass.	27,950.00
Diamond Rubber Co., 1876 Broadway, New York	$19,350.00 17,845.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	22,360.00
B. F. Goodrich Co., 66 Reade St., New York	20,425.00
Handlau-Buck Mfg. Co., St. Louis, Mo.	31,605.90
Frank Richter, 212 Jackson St., Seattle, Wash.	23,220.00
Trenton Rubber Mfg. Co., Trenton, N. J.	22,575.00
Voorhees Rubber Mfg. Co., 48 Dey St., New York	20,300.00
Bowers Rubber Works, 68 Sacramento St., San Francisco, Cal.	24,725.90

Class 143—Norfolk—22,000 Yds. Cotton Canvas.

Otto Geotze, 109 Worth St., New York	$ 6,883.25
John H. Meyer Co., 75 Worth St., New York	7,133.60
Old Dominion Paper Co., 98 Commercial St., Norfolk, Va.	9,059.60

Class 144—Norfolk—16,000 Yds. Cotton Canvas.

James R. Michael, 280 Broadway, New York	$ 4,250.00
Thomas N. Turner, 86 Worth St., New York	4,068.00
Old Dominion Paper Co., 98 Commercial St., Norfolk, Va.	3,559.00

Class 145 — Norfolk — 20,000 Yds. Hammock Canvas.

James R. Michael, 280 Broadway, New York	$18,200.00
R. M. Wilkinson Co., Box 843, Norfolk, Va.	15,200.00
Thomas N. Turner, 86 Worth St., New York	17,800.00
Old Dominion Paper Co., 98 Commercial St., Norfolk, Va.	12,860.00

Class 146—Norfolk—5,000 Yds. Flax Canvas.

DeGraw, Elmer & Co., 34 South St., New York	$ 2,604.00
O'Jaffee & Pinkus, 103 Franklin St., New York	2,680.00

Class 203—For delivering at Portsmouth, Boston, New York, League Island and Norfolk navy yards a quantity of Strip and Sheet Gum Gasket.

Boston Belting Co., 256 Devonshire St., Boston, Mass.	$34,160.00
Double Service Packing Co., 430 Walnut St., Philadelphia, Pa.	28,162.75
Diamond Rubber Co., 1876 Broadway, New York.	$24,255.00 22,359.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	28,028.00
B. F. Goodrich Co., 66 Reade St., New York	25,602.50
Clement, Restein & Co., 133 N. Second St., Philadelphia, Pa.	25,572.00
Revere Rubber Co., 95 Reade St., New York	$1 per lb.
Voorhees Rubber Mfg. Co., 48 Dey St., New York	25,602.50
James Boyd & Bro., 14 N. Fourth St., Philadelphia, Pa.	41,611.50

Class 222—For delivering a quantity of Miscellaneous Gaskets at all navy yards except Key West, Pensacola and New Orleans.

Double Service Packing Co., 430 Walnut St., Philadelphia, Pa. (part)	$14,825.96
H. W. Johns-Manville Co., 100 William St., New York.	23,716.50
Nightingale & Childs Co., 205 Congress St. (part), Boston, Mass.	2,577.20
New Jersey Asbestos Co., 52 Dey St., New York	24,014.65
Gaillott Metal Gasket Co., 97 South Clinton St., Chicago, Ill.	20,748.50
E. H. Pierce, 32 California St., San Francisco, Cal.	30,426.25

Class 224—Norfolk—1,000 Ft. Rubber Hose.

Boston Belting Co., 256 Devonshire St., Boston, Mass.	$ 850.00
Double Service Packing Co., 430 Walnut St., Philadelphia, Pa.	609.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	640.00
Handlau-Buck Mfg. Co., St. Louis, Mo.	945.00
Mallinson & Grossman, 23 Warren St., New York	730.00
Porter & Moore Co., Norfolk, Va.	700.00
Voorhees Rubber Mfg. Co., 48 Dey St., New York	750.00
John D. Westbrook, 265 Water St., New York	$1,050.00 950.00

BIDS FOR CONSTRUCTION OF REVENUE STEAMERS.

Bids received at the office of the United States Revenue Cutter Service, Treasury Department, Washington, D. C., and opened Nov. 27, for building a revenue cutter steamer for duty at Puget Sound, to be known as Revenue Cutter No. 20, and for a steamer for duty at Savannah, Ga., to be known as No. 21, were as follows:

	No. 20.	No. 21.	Both.
Newport News Ship Building & Dry Dock Co., Newport News, Va.	$215,000	$217,500	$396,500
Fore River Ship Building Co., Quincy, Mass.	.....	.....	415,000
New York Ship Building Co. Camden, N. J.	189,000	189,000	346,000
Pusey & Jones, Wilmington, Del.	215,000	216,500	414,450
Maryland Steel Co., Sparrows Pt., Md.	227,500	230,000	449,500

BIDS FOR REMOVING WRECK.

Bids for removing wreck of the Phineas H. Gay from Broad Sound, Boston Harbor, Mass., received by Maj. Edward Burr, Corps of Engineers, United States Army, Boston, Mass., and opened Nov. 18, as follows:

John Olsen, 3 Long Wharf, Boston, Mass.	$730.00
W. H. Wyman, 68 Devonshire St., Boston, Mass.	730.00
Betts Bros. & Co., 16 New St., East Boston, Mass.	347.00
George T. Rendle, 28 School St., Boston, Mass.	650.00

BIDS FOR DREDGING IN MATTATUCK HARBOR.

Bids for dredging in Mattatuck Harbor, N. Y., received by Col. John G. D. Knight, Corps of Engineers, United States Army, New York City, and opened Nov. 25, were as follows:

	Cents per cu. yd.
John P. Randerson, 755 Madison Ave., Albany, N. Y.	35
Atlantic Dredging Co., 15 Whitehall St., New York	43 3/10
J. Marvin Briggs, 154 Nassau St., New York	28 4/10
J. S. Packard Dredging Co., 425 Angell St., Providence, R. I.	49
Maritime Dredging Co., 78 Broad St., New York	23 2/3

BIDS FOR DREDGING IN NEWPORT HARBOR, R. I.

Bids for dredging in Newport Harbor, R. I., received by Col. J. H. Willard, Corps of

Engineers, United States Army, Newport, R. I., and opened Nov. 22, were as follows:

	Cents per cu. yd.
John P. Randerson, Albany, N. Y..	40
W. H. Beard Dredging Co., New York	29
International Contracting Co., New York	22
Charles M. Cole and J. S. Packard Dredging Co., Fall River, Mass., and Providence, R. I.	22 8/9

Approximate amount to be spent under this contract is $171,000.

BIDS FOR REPAIRING TENDER MAYFLOWER.

Bids received at the office of the Inspector of the Second Lighthouse District, Boston, Mass., for making repairs to the tender Mayflower, were as follows:

*Bertelsen & Petersen Engineering Co., East Boston, Mass.	$2,291.00
Fore River Ship Building Co., Quincy, Mass.	2,259.00
Lockwood Mfg. Co., East Boston, Mass.	2,545.00
Hodge Boiler Works, East Boston, Mass.	2,607.00

*Contract awarded.

BIDS FOR REPAIRING TENDER LILAC.

Bids received at the office of the Inspector of the First Lighthouse District, Portland, Me., and opened Nov. 9, for making repairs to the tender Lilac, were as follows:

*Bertelsen & Petersen Engineering Co., East Boston, Mass.	$13,750.00
Bath Iron Works, Bath, Me.	22,994.00
Portland Co., Portland, Me.	23,995.00

*Contract awarded.

BIDS FOR NAVAL SUPPLIES.

Bids were received at the bureau of supplies and accounts, navy department, on Dec. 3, for material and supplies for the navy yards as follows:

Class 51—Mare Island—280 Sq. Yds. Sheet Rubber.

American Rubber Mfg. Co., Emeryville, Cal.	$ 8,370.32
Bowers Rubber Works, 68 Sacramento St., San Francisco.	8,745.00
Boston Belting Co., 256 Devonshire St., Boston, Mass.	15,179.50
Diamond Rubber Co., 189 Broadway, New York	7,576.35
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York.	8,272.00
Handlan-Buck Mfg. Co., St. Louis, Mo.	15,179.50
John H. Meyer Co., 75 North St., New York	2,250.00
Voorhies Rubber Mfg. Co., 18 Dey St., New York	7,532.90

Class 61—Mare Island—Valves.

Buckeye Iron & Brass Works, Dayton, O.	$ 2,325.60
Baker & Hamilton, 900 Third St., San Francisco, Cal.	3,948.90
Hartman Co., 1231 N. Front St., Philadelphia, Pa.	3,178.90
Handlan-Buck Mfg. Co., St. Louis, Mo.	3,219.60
Knox & Bro., 99 John St., New York	2,961.78
Lunkenheimer Co., Cincinnati, O.	3,203.02
Manning, Maxwell & Moore, 85 Liberty St., New York.	3,140.69
Manhattan Supply Co., 127 Franklin St., New York	2,651.93
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.	2,943.00

Class 62—Mare Island—65 Doz. Gate Valves.

Buckeye Iron & Brass Works, Dayton, O.	$ 1,421.40
Baker & Hamilton, 900 Third St., San Francisco, Cal.	2,001.00
Dunham, Carrigan & Hayden Co., 100 Kansas St., San Francisco, Cal.	3,517.50
Manhattan Supply Co., 127 Franklin St., New York	2,068.35
Charles E. Robidoux, Chemical Bldg., St. Louis, Mo.	1,237.45
Central Metal Supply Co., 609 E. Lombard St., Baltimore, Md.	1,495.00

Class 103—Pensacola—Two Globe and Six Relief Valves.

Ashton Valve Co., 271 Franklin St., Boston, Mass.	$ 288.00
Lunkenheimer Co., Cincinnati, O.	246.00
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.	232.00

Class 111—Brooklyn—Cable.

General Electric Co., Schenectady, N. Y.	$20,197.00
Standard Underground Cable Co., Westinghouse Bldg., Pittsburg, Pa.	25,643.80 / 29,040.30 / 33,031.80
Safety Insulated Mill & Cable Co., Bayonne, N. J.	32,724.50 / 30,522.00 / 19,879.00
Vermilye & Power, 17 Battery Pl., New York	25,089.00

Class 174—Washington—One Motor.

General Electric Co., Schenectady, N. Y.	$ 1,355.00
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.	1,675.00

Class 233—Boston—Valves.

Bridgeman Bros. Co., 1422 Washington Ave., Philadelphia, Pa.	$ 3,749.56
Crane Co., Chicago, Ill.	3,660.18
R. W. Geldart, 2 Stone St., New York	2,150.39
E. F. Keating Co., 452 Water St., New York	2,658.15
Knox & Bro., 99 John St., New York	2,132.36
Lunkenheimer Co., Cincinnati, O.	2,691.00
Manning, Maxwell & Moore, 85 Liberty St., New York.	2,190.33
Montgomery & Co., 105 Fulton St., New York	2,177.20
Manhattan Supply Co., 127 Franklin St., New York	1,930.21
William Powell & Co., 2521 Spring Grove Ave., Cincinnati, O.	2,239.34
Walworth Mfg. Co., 132 Federal St., Boston, Mass.	2,980.90
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.	3,128.60

Class 234—League Island—Valves.

Bridgeman Bros. Co., 1422 Washington Ave., Philadelphia, Pa.	$ 554.22
Crane Co., Chicago, Ill.	615.24
R. W. Geldart, 2 Stone St., New York	509.16
Hartman Co., 1231 N. Front St., Philadelphia, Pa.	507.30
Handlan-Buck Mfg. Co., St. Louis, Mo.	516.60
E. F. Keating Co., 452 Water St., New York	549.75
Knox & Bro., 99 John St., New York	508.06
Lunkenheimer Co., Cincinnati, O.	576.36
Manning, Maxwell & Moore, 85 Liberty St., New York.	531.77
Montgomery & Co., 105 Fulton St., New York	518.52
Manhattan Supply Co., 127 Franklin St., New York	440.28
William Powell & Co., 2521 Spring Grove Ave., Cincinnati, O.	538.02
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.	514.44

Class 235—Boston—17 Doz. Gate Valves.

James B. Clow & Son, 342 Franklin St., Chicago, Ill.	$ 1,649.40
R. W. Geldart, 2 Stone St., New York	1,139.48
E. F. Keating Co., 452 Water St., New York	1,545.52
Manhattan Supply Co., 127 Franklin St., New York.	1,145.00
William Powell & Co., 2521 Spring Grove Ave., Cincinnati, O.	1,579.56
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.	693.00

Class 236—Boston—16 Doz. Gate Valves.

Bridgeman Bros. Co., 1422 Washington Ave., Philadelphia, Pa.	$ 1,692.80
James B. Clow & Son, 342 Franklin St., Chicago, Ill.	2,332.80
R. W. Geldart, 2 Stone St., New York	3,610.00
E. F. Keating Co., 452 Water St., New York	4,387.20
Lunkenheimer Co., Cincinnati, O.	4,056.00
Manhattan Supply Co., 127 Franklin St., New York.	2,072.40
William Powell & Co., 2521 Spring Grove Ave., Cincinnati, O.	3,936.00
Pancoast, Rogers & Richards, 28 Platt St., New York	2,461.36
Walworth Mfg. Co., 132 Federal St., Boston, Mass.	2,152.32
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.	5,648.00

Class 237—Brooklyn—144 Gate Valves.

Crane Co., Chicago, Ill.	$ 1,346.40
R. W. Geldart, 2 Stone St., New York	2,630.88
Jenkins Mfg. Co., 20 Vesey St., New York	1,208.88
Manhattan Supply Co., 127 Franklin St., New York	2,592.00
William Powell & Co., 2521 Spring Grove Ave., Cincinnati, O.	2,880.00
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.	4,032.00
Pancoast, Rogers & Richards, 28 Platt St., New York	1,327.68

Class 238—Brooklyn—12 Gate Valves.

James B. Clow & Son, 342 Franklin St., Chicago, Ill.	$ 1,152.00
R. W. Geldart, 2 Stone St., New York	1,523.44
E. F. Keating Co., 452 Water St., New York	1,020.00
Manhattan Supply Co., 127 Franklin St., New York	1,320.00
Midvale Steel Co., Box 1606, Philadelphia, Pa.	3,774.25
William Powell & Co., 2521 Spring Grove Ave., Cincinnati, O.	1,800.00
Central Metal & Supply Co., 609 E. Lombard St., Baltimore Md.	1,416.06

Class 239—League Island—192 Gate Valves and Quantity Flange Valves.

Crane Co., Chicago, Ill., (part)	$ 2,476.10
James B. Clow & Son, 342 Franklin St., Chicago, Ill.	6,707.40
R. W. Geldart, 2 Stone St., New York	7,465.90
E. F. Keating Co., 452 Water St., New York (part)	1,512.12
Lunkenheimer Co., Cincinnati, O., (part)	4,606.00
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.	4,034.60

Class 240—League Island—43 Gate Valves.

Bridgeman Bros. Co., 1422 Washington Ave., Philadelphia, Pa.	$ 464.40
Crane Co., Chicago.	520.30
Carter Rice Co., 46 Devonshire St., Boston, Mass.	593.40
R. W. Geldart, 2 Stone St., New York	572.90
Lunkenheimer Co., Cincinnati, O.	997.60
Manhattan Supply Co., 127 Franklin St., New York	860.00
William Powell & Co., 2521 Spring Grove Ave., Cincinnati, O.	1,083.60
Pancoast, Rogers & Richards, 28 Platt St., New York	581.79
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.	1,376.00

BREAKWATER AT GRAND RAPIDS.

Following is an abstract of bids received by Col. M. B. Adams, government engineer at Grand Rapids, Mich., for the construction of breakwaters, consisting of crib work, at Ludington Harbor, Mich.: L. E. Schnorbach & Co., Muskegon, Mich., $621,063.17; Great Lakes Dredge & Dock Co., Chicago, Ill., $652,059.03; Burk, Smith & Nelson, Muskegon, Mich., $652,088.62; Greiling Bros., Green Bay, Wis., $668,109.36; Patrick Kechane, Fayetteville, N. Y.: $703,046.39; Wm. H. Gillen, Milwaukee, Wis., $735,946.49.

DREDGING IN MUSKEGON HARBOR.

Following is an abstract of bids for dredging in Muskegon Harbor, Mich., received by Col. M. B. Adams, government engineer at Grand Rapids, Mich.: Greiling Bros., Green Bay, Wis., $34,390.62; Samuel O. Dixon, Milwaukee, Wis., $44,368.75; Great Lakes Dredge & Dock Co., Chicago, Ill., $51,585.93; Graves & Stephens, Cleveland, O., $57,156.25; Fitzsimmons & Connell Co., Chicago, Ill., $75,562.50.

BIDS FOR LOCKS AND DAMS.

Bids for building locks and dams Nos. 14 and 15, Black Warrior river, and lock tender houses, received by Maj. H. Jervey, corps of engineers, U. S. army, Mobile, Ala., and opened Nov. 25, were as follows:

	Lock 14.	Lock 15.
Dravo Contracting Co., Lewis Block, Pittsburg, Pa.	$330,223.50	$360,173.00
Lane Bros. Co., Lynchburg, Va.	339,947.50	363,084.40

BUOY STRAPS AND BOLTS.

Bids received at the office of the fifth lighthouse district at Baltimore, Md., on Nov. 29, for furnishing buoy straps and wrought iron bolts for spar buoys in that district were as follows:

*Elizabeth Iron Works, Norfolk, Va.	$ 793.00
Highland Machine Works, Baltimore, Md.	819.00
Thomas W. Godwin & Co., Norfolk, Va.	837.30
Lumley-Dodson Co., Norfolk, Va.	905.00
Spedden Ship Building Co., Baltimore, Md.	1,071.50
Adams & Co., Baltimore, Md.	1,072.60
E. J. Codd Co., Baltimore, Md.	1,099.10
John H. Fluskey, Baltimore, Md.	1,220.00
Norfolk Marine Railway Co., Berkley, Va.	1,745.88

*Accepted.

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Almy Water Tube Boiler Co.. 37
American Injector Co..... 11
American Line 47
American Sawdolet Co..... 47
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American Ship Windlass Co.. 2
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*Armstrong Mfg. Co..... —
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†Columbian Rope Co..... —
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Unique Engineering Co..... 2
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U. S. Engineer Office, Boston, Mass., Nov. 27, 1907. To whom it may concern. Whereas navigation is obstructed and endangered by wreck of steamship "City of Birmingham," lying in the Upper Main Ship Channel, Boston Harbor, Mass.; notice is hereby given that unless otherwise removed within thirty days it will be removed by the United States under authority of law. Sealed proposals for its removal will be received here until 12 M., December 27, 1907, and then publicly opened. Information on application. Edw. Burr, Maj. Engrs.

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